FINALTERM EXAMINATION
Fall 2009
Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

Let $y=\frac{x^2}{2}$. Find average rate of change of y with respect to x over the interval [3, 4]

- $\frac{25}{2}$
- $\frac{7}{2}$
- $\frac{25}{14}$
- $\frac{7}{14}$

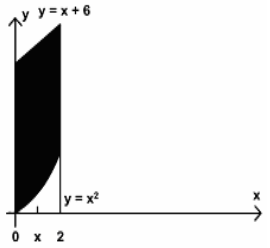
Question No: 2 (Marks: 1) - Please choose one

If $2x-y=-3$ then $\frac{dy}{dx}=$

- **2**
- -2
- 0
- -3

Question No: 3 (Marks: 1) - Please choose one

In the following figure, the area bounded on the sides by the lines are **:**



- $x=0$
- $x=2$
- $x=0 \text{ and } x=2$
- $x=6$

Question No: 4 (Marks: 1) - Please choose one

What is the sum of following series?

$1+2+3+4+\_\_\_\_\_+n$

- $\frac{n+1}{2}$
- $\frac{(n+1)(n+2)}{2}$
- $\frac{n(n+2)}{2}$
- $\frac{n(n+1)}{2}$

Question No: 5 (Marks: 1) - Please choose one

Let f is a smooth function on [0, 3]. What will be the arc length L of the curve y = f(x) from

x = 0 to x = 3?

- $L=\int_0^3 \sqrt{1+[f(x)]^2}\,dy$

$$L=\int_a^b \sqrt{1+[f'(x)]^2}$$

►

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dy$$

►

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dx$$

►

Question No: 6 (Marks: 1) - Please choose one

The PYTHAGORAS theorem describes the relationship between the sides of .....► **Right angle triangle** .....

► **Right angle triangle**
► Isoceleous triangle
► Equilateral triangle

Question No: 7 (Marks: 1) - Please choose one

Which operation can not be applied on the functions?

► Subtraction
► **Cross product**
► Addition
► Composition

Question No: 8 (Marks: 1) - Please choose one

The graph of the equation $y=x^2-4x+5$ will represent

► **Parabola**
► Straight line
► Two straight lines

► Ellipse

Question No: 9 (Marks: 1) - Please choose one

Polynomials are always ..... functions

► **Continuous**
► Discontinuous

Question No: 10 (Marks: 1) - Please choose one

The tan(x) is discontinuous at the points where

► Cos(x) =0
► Sin(x) =0
► **Tan(x) =0**

Question No: 11 (Marks: 1) - Please choose one

A differentiable function must be differentiable on the interval

$(-\infty,\infty)$

► $(0,\infty)$

► $(-\infty,\infty)$

► (a,∞) *where a is any negative* int *eger*

Question No: 12 (Marks: 1) - Please choose one

Let $y=(x^3+2x)^{37}$. Which of the following is correct?

$$\frac{dy}{dx}=(37)(x^3+2x)^{36}$$

►

► $$\frac{dy}{dx}=111x^2(x^3+2x)^{36}$$

► $$\frac{dy}{dx}=(111x^2+74)(x^3+2x)^{36}$$

► $$\frac{dy}{dx}=(111x^2+74)(x^3+2x)^{38}$$

►

Question No: 13 (Marks: 1) - Please choose one

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx$$

Consider the indefinite integral

Let $t=x^3+2x^2+x-3$

Is the following substitution correct?

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx=\int \frac{1}{t}\,dt$$

► Yes
► **No**

Question No: 14 (Marks: 1) - Please choose one

$\log_b ac =$ _____

► $\log_b a + \log_b c$

► $\log_b a - \log_b c$

► $\frac{\log_b a}{\log_b c}$

► $(\log_b a)(\log_b c)$

Question No: 15 (Marks: 1) - Please choose one

If a function has an extreme value (either a maximum or a minimum) on an open interval (a,b), then the extreme value occurs at ..... of f

► First point

► Mid point

► **Critical point**

► End point

Question No: 16 (Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ..... "

► $f'(c) = \frac{f(b) - f(a)}{b - a}$

► $f(c) = \frac{f(b) - f(a)}{b - a}$

► $f(c) = \frac{f(a) - f(b)}{b - a}$

► $f'(c) = \frac{f(a) - f(b)}{b - a}$

Question No: 17 (Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)] = f(x)$$

If there is some function *F* such that then any function of the form $F(x) + C$ is ---------- of $f(x)$

► Derivative

► **Antiderivative**

► Slope

► Maximum value

Question No: 18 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\,\Delta x_k$$

The sum is known as:

► **Riemann Sum**

► General Sum

► Integral Sum

► Geometric Sum

Question No: 19 (Marks: 1) - Please choose one

$$\int_0^{\frac{\pi}{2}} \cos u \, du$$

If , then which of the following is true?

► 2

► **1**

► 0

► -1

Question No: 20 (Marks: 1) - Please choose one

$$\int_0^{\pi} \sin u \, du$$

If , then which of the following is true?

► 1

► 2

► **0**

► -1

Question No: 21 (Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)] = f(x)$$

If there is some function *F* such that then antiderivatives of $f(x)$ are $F(x) + C$. What does *C* represents?

► Polynomial

► **Constant**

► Dependent Variable

► Independent Variable

Question No: 22 (Marks: 1) - Please choose one

If f and g are continues function on an interval [a, b] and $f(x) \geq g(x) \ for \ a \leq x \leq b$, then area is bounded by the lines parallel to:

► X -axis
► Y-axis
► Both X -axis and Y-axis

Question No: 23 (Marks: 1) - Please choose one

$\int_{1}^{2/3} dx = \_\_\_\_\_$

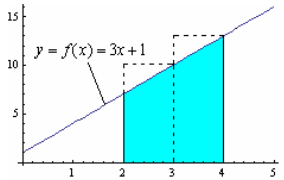
► $\frac{-1}{3}$
► 0
► $\frac{1}{3}$
► $\frac{2}{3}$

Question No: 24 (Marks: 1) - Please choose one

$\int_{0}^{2} x \ dx = \_\_\_\_\_$

► **2**

► 0
► **2**
► -2
► $\frac{x^2}{2}$

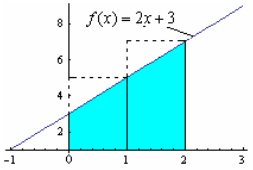


Question No: 25 (Marks: 1) - Please choose one

Which of the following is approximate area of the shaded region by taking x_1^* and x_2^* as left endpoint of equal-length subintervals?

► 17
► 20
► **23**
► 26

Question No: 26 (Marks: 1) - Please choose one



Which of the following is approximate area of the shaded region by taking x_1^* and x_2^* as right endpoint of equal-length subintervals?

► 8
► 10
► 12
► 14

Question No: 27 (Marks: 1) - Please choose one

What is the length of each sub-interval, if the interval [1,3] is divided into n sub-intervals of equal length?

► $\frac{1}{n}$
► $\frac{2}{n}$
► $\frac{3}{n}$
► $\frac{4}{n}$

Question No: 28 (Marks: 1) - Please choose one

Evaluate

$\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = - - - - -$

► **4**
► 2
► 1
► ∞

Question No: 29 (Marks: 1) - Please choose one

$\left\{ \frac{1}{2^n} \right\}_1^n$

represents the sequence**:**

► $\frac{-1}{2}, \frac{-1}{4}, \frac{-1}{8}, \ldots$

► $\frac{1}{2},\frac{1}{4},\frac{1}{8},\ldots$

► $0,1,\frac{1}{2},\frac{1}{4},\ldots$

► $0,1,2,3\ldots$

Question No: 30 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1}-a_n \le 0$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n}>1$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 32 (Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

► Divergent
► Convergent
► Give no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a+ar+ar^2+ar^3+\ldots+ar^{k-1}+\ldots \ \ where\ (a\neq 0)$, $|r|<1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If $\rho=\lim_{k\to+\infty}\sqrt[k]{u_k}$ where $\rho>1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

Question No: 35 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty}(-1)^{k+1}\frac{1}{k}$$

Which of the following is true for the series ?

► Arithmetic Series
► Geometric Series
► Alternating Harmonic Series
► Harmonic Series

Question No: 36 (Marks: 1) - Please choose one

.....is the special case of Tylor's theorem.

► Roll's Theorem
► Picard's Method
► Integration
► Maclaurin's Theorem

Question No: 37 (Marks: 1) - Please choose one

If f is integrable on a closed interval containing the four points *a*, *b*, *c* and *d* then

$\int_a^d f(x)dx =$ _____

► $\int_a^b f(x)\,dx+\int_b^c f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^b f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^c f(x)\,dx+\int_b^d f(x)\,dx$

► $\int_a^d f(x)\,dx$

►

Question No: 38 (Marks: 1) - Please choose one

Suppose f and g are integrable functions on [*a*, *b*] and *c* is a constant, then

$\int_a^b c\,[f(x)+g(x)]\,dx =$ _____

$\int_a^b f(cx)dx + \int_a^b g(cx)dx$

►

$\int_a^b f(x)\,dx + \int_a^b g(x)]\,dx$

►

$c\int_a^b f(x)dx + c\int_a^b g(x)dx$

►

► 0

Question No: 39 (Marks: 1) - Please choose one

What is the difference between the values of the

$\int_a^b f(x)dx \quad and \quad \int_a^b f(t)dt$

integrals ?

► Differ by b-a
► Differ by a-b
► **No difference**
► Differ by b+a

Question No: 40 (Marks: 1) - Please choose one

$\int_{-1}^{2} f(x)\,dx = 5 \qquad \int_{-1}^{2} g(x)\,dx = -3$

If and then which of the following is value

$\int_{-1}^{2} [f(x) + 2g(x)]\,dx$

of ?

► **-1**
► -8
► 2
► 11

Question No: 41 (Marks: 2)

$\frac{1}{1} + \frac{1}{8} + \frac{1}{27} + ... + \frac{1}{1000}$

Express the sum in sigma notation.

$\sum_{n=1}^{10} (1/n^3)$

Question No: 42 (Marks: 2)

Only write down the Maclaurin series for e^x

Question No: 43 (Marks: 2)

Evaluate the following integral:

$\int_1^4 \sqrt{x}\ dx$

$\int_1^4 \sqrt{x}\,dx$

$= \int_1^4 \sqrt{x}.1dx$

$= x\sqrt{x} + \int_1^4 1/\sqrt{x}.1dx$

Question No: 44 (Marks: 3)

Evaluate the following sum:

$\sum_{k=1}^{6} (k^2 - 5)$

$= -4 - 1 + 4 + 11 + 20 + 31 = 61$

Question No: 45 (Marks: 3)

Find a definite integral indicating the area enclosed by the curves $y = x^2 \ , \ x > 0$ and bounded on the sides by the lines $y = 1$ and $y = 4$. But do not evaluate the integral.

Question No: 46 (Marks: 3)

$a_n = \left\{\frac{3}{n^2}\right\}_{n=5}^{\infty}$

Determine whether the following sequence is strictly monotone or not.If your answer is yes or no, then give reason .

Yes the sequence is strictly monotone because the denominator is increasing

Question No: 47 (Marks: 5)

The region bounded by the *y*-axis, the graph of the equation $x = y^{\frac{3}{2}}$ and the line *y* = 2 is revolved about *y*-axis. Find the volume of the resulting solid.

Question No: 48 (Marks: 5)

Compute the following sum:

$\sum_{i=1}^{n} \left(4i^2 - i\right) = \left(4(1)^2 - 1\right) + \left(4(2)^2 - 2\right) + \left(4(3)^2 - 3\right) + \left(4(4)^2 - 4\right) .....$

$= 3 + 14 + 33 + 60 .....$

Question No: 49 (Marks: 5)

Use L`Hopital's rule to evaluate the limit

$$\lim_{x\to\frac{\pi}{2}} \frac{1-\sin x}{1+\cos 2x}$$

$$\lim_{x\to\frac{\pi}{2}} (1-\sin x)=0 \lim_{x\to\frac{\pi}{2}} (1+\cos 2x)=0$$

$$=0/0$$

So by L'Hopital's rule

$$\lim_{x\to\frac{\pi}{2}} \frac{1-\sin x}{1+\cos 2x}$$

$$=\lim_{x\to\frac{\pi}{2}} \frac{d/dx(1-\sin x)}{d/dx(1+\cos 2x)}$$

$$=\lim_{x\to\frac{\pi}{2}} \frac{-\cos x}{-2\sin 2x}=\frac{\cos\frac{\pi}{2}}{2\sin\pi}=0$$

Question No: 50 (Marks: 10)

$$\sum_{1}^{\infty} \frac{2^n}{n(n+2)}$$

Use the Ratio test to determine whether the series converges or diverges.

$$p=\lim_{x\to\infty} \frac{u_{k+1}}{u_k}=$$

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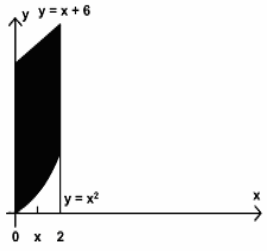

- ► $x = 0$
- ► $x = 2$
- ► $x = 0 \text{ and } x = 2$
- ► $x = 6$

Question No: 4 (Marks: 1) - Please choose one

What is the sum of following series?

$1 + 2 + 3 + 4 + \_\_\_\_\_ + n$

- ► $\frac{n+1}{2}$
- ► $\frac{(n+1)(n+2)}{2}$
- ► $\frac{n(n+2)}{2}$
- ► $\frac{n(n+1)}{2}$

Question No: 5 (Marks: 1) - Please choose one

Let f is a smooth function on [0, 3]. What will be the arc length L of the curve y = f(x) from x = 0 to x = 3?

- ► $L = \int_0^3 \sqrt{1 + [f(x)]^2}\, dy$
- ► $L = \int_a^b \sqrt{1 + [f'(x)]^2}$
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- ► Discontinuous

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- Cos(x) =0
- Sin(x) =0
- **Tan(x) =0**

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A differentiable function must be differentiable on the interval

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$$\int \frac{3x^2 + 4x + 1}{x^3 + 2x^2 + x - 3}\, dx$$

Consider the indefinite integral

Let $t = x^3 + 2x^2 + x - 3$

Is the following substitution correct?

$$\int \frac{3x^2 + 4x + 1}{x^3 + 2x^2 + x - 3}\, dx = \int \frac{1}{t}\, dt$$

- Yes
- **No**

Question No: 14 (Marks: 1) - Please choose one

$\log_b ac =$ _____

- $\log_b a + \log_b c$
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- $f'(c) = \frac{f(b) - f(a)}{b - a}$
- $f(c) = \frac{f(b) - f(a)}{b - a}$
- $f(c) = \frac{f(a) - f(b)}{b - a}$
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► **1**
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$$\int_1^{2/3} dx = \_\_\_\_\_$$

► $\frac{-1}{3}$
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Question No: 24 (Marks: 1) - Please choose one

$$\int_0^2 x\ dx = \_\_\_\_\_$$

► **2**
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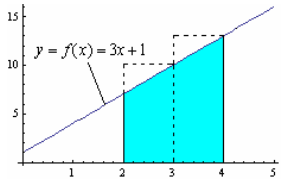

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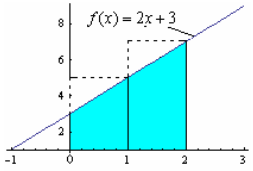

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► $\frac{2}{n}$
► $\frac{3}{n}$
► $\frac{4}{n}$

Question No: 28 (Marks: 1) - Please choose one

Evaluate

$\lim_{x\to 2}\frac{x^2-4}{x-2} = -----$

► 4
► 2
► 1
► ∞

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$\left\{\frac{1}{2^n}\right\}_1^n$

represents the sequence:

► $\frac{-1}{2},\frac{-1}{4},\frac{-1}{8},\ldots$
► $\frac{1}{2},\frac{1}{4},\frac{1}{8},\ldots$
► $0,1,\frac{1}{2},\frac{1}{4},\ldots$
► $0,1,2,3\ldots$

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► Give no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + \ldots + ar^{k-1} + \ldots \quad where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

► **Converges**
► Diverges
► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If $\rho = \lim_{k\to+\infty} \sqrt[k]{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

► **Convergent**

► Divergent
► Give no information

Question No: 35 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty}(-1)^{k+1}\frac{1}{k}$$

Which of the following is true for the series ?

► Arithmetic Series
► Geometric Series
► **Alternating Harmonic Series**
► Harmonic Series

Question No: 36 (Marks: 1) - Please choose one

.....is the special case of Tylor's theorem.

► **Roll's Theorem**
► Picard's Method
► Integration
► Maclaurin's Theorem

Question No: 37 (Marks: 1) - Please choose one

If f is integrable on a closed interval containing the four points *a*, *b*, *c* and *d* then

$$\int_a^d f(x)dx = \_\_\_\_\_$$

► $\int_a^b f(x)\,dx+\int_b^c f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^b f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^c f(x)\,dx+\int_b^d f(x)\,dx$

► $\int_a^d f(x)\,dx$

►

Question No: 38 (Marks: 1) - Please choose one

Suppose f and g are integrable functions on [*a*, *b*] and *c* is a constant, then

$$\int_a^b c\,[f(x)+g(x)]\,dx = \_\_\_\_\_$$

► $\int_a^b f(cx)dx+\int_a^b g(cx)dx$

► $\int_a^b f(x)\,dx+\int_a^b g(x)]\,dx$

► $c\int_a^b f(x)dx+c\int_a^b g(x)dx$

►

► 0

Question No: 39 (Marks: 1) - Please choose one

What is the difference between the values of the

$$\int_a^b f(x)dx \quad and \quad \int_a^b f(t)dt$$

integrals ?

► Differ by b-a
► Differ by a-b
► **No difference**
► Differ by b+a

Question No: 40 (Marks: 1) - Please choose one

If $\int_{-1}^{2} f(x)\,dx=5$ and $\int_{-1}^{2} g(x)\,dx=-3$ then which of the following is value of $\int_{-1}^{2}[f(x)+2g(x)]\,dx$?

► **-1**
► -8
► 2
► 11

Question No: 41 (Marks: 2)

Express the sum $\frac{1}{1}+\frac{1}{8}+\frac{1}{27}+.....+\frac{1}{1000}$ in sigma notation.

$\sum_{n=1}^{10}(1/n^3)$

Question No: 42 (Marks: 2)

Only write down the Maclaurin series for e^x

Question No: 43 (Marks: 2)

Evaluate the following integral:

$$\int_1^4 \sqrt{x}\ dx$$

$$\int_1^4 \sqrt{x}\, dx$$

$$= \int_1^4 \sqrt{x}.1\, dx$$

$$= x\sqrt{x} + \int_1^4 1/\sqrt{x}.1\, dx$$

Question No: 44 (Marks: 3)

Evaluate the following sum:

$$\sum_{k=1}^{6} (k^2 - 5)$$

$$= -4 - 1 + 4 + 11 + 20 + 31 = 61$$

Question No: 45 (Marks: 3)

Find a definite integral indicating the area enclosed by the curves $y = x^2\ ,\ \ x > 0$ and bounded on the sides by the lines $y = 1$ and $y = 4$. But do not evaluate the integral.

Question No: 46 (Marks: 3)

$$a_n = \left\{\frac{3}{n^2}\right\}_{n=5}^{\infty}$$

Determine whether the following sequence is strictly monotone or not.If your answer is yes or no, then give reason .

Yes the sequence is strictly monotone because the denominator is increasing

Question No: 47 (Marks: 5)

The region bounded by the *y*-axis, the graph of the equation $x = y^{\frac{3}{2}}$ and the line *y* = 2 is revolved about *y*-axis. Find the volume of the resulting solid.

Question No: 48 (Marks: 5)

Compute the following sum:

$$\sum_{i=1}^{n} \left(4i^2 - i\right) = \left(4(1)^2 - 1\right) + \left(4(2)^2 - 2\right) + \left(4(3)^2 - 3\right) + \left(4(4)^2 - 4\right) \ldots\ldots\ldots\ldots$$

$$= 3 + 14 + 33 + 60 \ldots\ldots\ldots\ldots\ldots\ldots$$

Question No: 49 (Marks: 5)

Use L'Hopital's rule to evaluate the limit

$$\lim_{x \to \frac{\pi}{2}} \frac{1 - \sin x}{1 + \cos 2x}$$

$$\lim_{x \to \frac{\pi}{2}} (1 - \sin x) = 0 \lim_{x \to \frac{\pi}{2}} (1 + \cos 2x) = 0$$

$$= 0/0$$

So by L'Hopital's rule

$$\lim_{x \to \frac{\pi}{2}} \frac{1 - \sin x}{1 + \cos 2x}$$

$$= \lim_{x \to \frac{\pi}{2}} \frac{d/dx(1 - \sin x)}{d/dx(1 + \cos 2x)}$$

$$= \lim_{x \to \frac{\pi}{2}} \frac{-\cos x}{-2\sin 2x} = \frac{\cos \frac{\pi}{2}}{2\sin \pi} = 0$$

Question No: 50 (Marks: 10)

$$\sum_{1}^{\infty} \frac{2^n}{n(n+2)}$$

Use the Ratio test to determine whether the series converges or diverges.

$$p = \lim_{x \to \infty} \frac{u_{k+1}}{u_k} =$$

FINALTERM EXAMINATION
Fall 2009
Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

Let $y=\frac{x^2}{2}$. Find average rate of change of y with respect to x over the interval [3, 4]

- $\frac{25}{2}$
- $\frac{7}{2}$
- $\frac{25}{14}$
- $\frac{7}{14}$

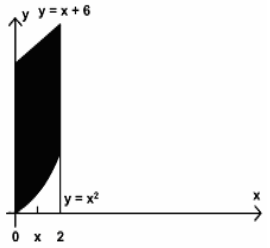
Question No: 2 (Marks: 1) - Please choose one

If $2x-y=-3$ then $\frac{dy}{dx}=$

- **2**
- -2
- 0
- -3

Question No: 3 (Marks: 1) - Please choose one

In the following figure, the area bounded on the sides by the lines are **:**



- $x=0$
- $x=2$
- $x=0 \text{ and } x=2$
- $x=6$

Question No: 4 (Marks: 1) - Please choose one

What is the sum of following series?

$1+2+3+4+\_\_\_\_\_+n$

- $\frac{n+1}{2}$
- $\frac{(n+1)(n+2)}{2}$
- $\frac{n(n+2)}{2}$
- $\frac{n(n+1)}{2}$

Question No: 5 (Marks: 1) - Please choose one

Let f is a smooth function on [0, 3]. What will be the arc length L of the curve y = f(x) from

x = 0 to x = 3?

- $L=\int_0^3 \sqrt{1+[f(x)]^2}\,dy$

$$L=\int_a^b \sqrt{1+[f'(x)]^2}$$

►

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dy$$

►

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dx$$

►

Question No: 6 (Marks: 1) - Please choose one

The PYTHAGORAS theorem describes the relationship between the sides of .....► **Right angle triangle** .....

► **Right angle triangle**
► Isoceleous triangle
► Equilateral triangle

Question No: 7 (Marks: 1) - Please choose one

Which operation can not be applied on the functions?

► Subtraction
► **Cross product**
► Addition
► Composition

Question No: 8 (Marks: 1) - Please choose one

The graph of the equation $y=x^2-4x+5$ will represent

► **Parabola**
► Straight line
► Two straight lines

► Ellipse

Question No: 9 (Marks: 1) - Please choose one

Polynomials are always ..... functions

► **Continuous**
► Discontinuous

Question No: 10 (Marks: 1) - Please choose one

The tan(x) is discontinuous at the points where

► Cos(x) =0
► Sin(x) =0
► **Tan(x) =0**

Question No: 11 (Marks: 1) - Please choose one

A differentiable function must be differentiable on the interval

$(-\infty,\infty)$

► $(0,\infty)$

► $(-\infty,\infty)$

► (a,∞) *where a is any negative* int *eger*

Question No: 12 (Marks: 1) - Please choose one

Let $y=(x^3+2x)^{37}$. Which of the following is correct?

$$\frac{dy}{dx}=(37)(x^3+2x)^{36}$$

►

► $$\frac{dy}{dx}=111x^2(x^3+2x)^{36}$$

► $$\frac{dy}{dx}=(111x^2+74)(x^3+2x)^{36}$$

► $$\frac{dy}{dx}=(111x^2+74)(x^3+2x)^{38}$$

►

Question No: 13 (Marks: 1) - Please choose one

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx$$

Consider the indefinite integral

Let $t=x^3+2x^2+x-3$

Is the following substitution correct?

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx=\int \frac{1}{t}\,dt$$

► Yes
► **No**

Question No: 14 (Marks: 1) - Please choose one

$\log_b ac =$ _____

► $\log_b a + \log_b c$

► $\log_b a - \log_b c$

► $\frac{\log_b a}{\log_b c}$

► $(\log_b a)(\log_b c)$

Question No: 15 (Marks: 1) - Please choose one

If a function has an extreme value (either a maximum or a minimum) on an open interval (a,b), then the extreme value occurs at ..... of f

► First point

► Mid point

► **Critical point**

► End point

Question No: 16 (Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ..... "

► $f'(c) = \frac{f(b) - f(a)}{b - a}$

► $f(c) = \frac{f(b) - f(a)}{b - a}$

► $f(c) = \frac{f(a) - f(b)}{b - a}$

► $f'(c) = \frac{f(a) - f(b)}{b - a}$

Question No: 17 (Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)] = f(x)$$

If there is some function *F* such that then any function of the form $F(x) + C$ is ---------- of $f(x)$

► Derivative

► **Antiderivative**

► Slope

► Maximum value

Question No: 18 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\,\Delta x_k$$

The sum is known as:

► **Riemann Sum**

► General Sum

► Integral Sum

► Geometric Sum

Question No: 19 (Marks: 1) - Please choose one

$$\int_0^{\frac{\pi}{2}} \cos u \, du$$

If , then which of the following is true?

► 2

► **1**

► 0

► -1

Question No: 20 (Marks: 1) - Please choose one

$$\int_0^{\pi} \sin u \, du$$

If , then which of the following is true?

► 1

► 2

► **0**

► -1

Question No: 21 (Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)] = f(x)$$

If there is some function *F* such that then antiderivatives of $f(x)$ are $F(x) + C$. What does *C* represents?

► Polynomial

► **Constant**

► Dependent Variable

► Independent Variable

Question No: 22 (Marks: 1) - Please choose one

If f and g are continues function on an interval [a, b] and $f(x) \geq g(x) \ for \ a \leq x \leq b$, then area is bounded by the lines parallel to:

► X -axis
► Y-axis
► Both X -axis and Y-axis

Question No: 23 (Marks: 1) - Please choose one

$\int_{1}^{2/3} dx = \_\_\_\_\_$

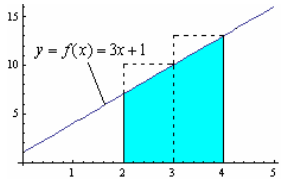
► $\frac{-1}{3}$
► 0
► $\frac{1}{3}$
► $\frac{2}{3}$

Question No: 24 (Marks: 1) - Please choose one

$\int_{0}^{2} x \ dx = \_\_\_\_\_$

► **2**

► 0
► **2**
► -2
► $\frac{x^2}{2}$

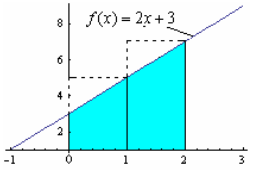


Question No: 25 (Marks: 1) - Please choose one

Which of the following is approximate area of the shaded region by taking x_1^* and x_2^* as left endpoint of equal-length subintervals?

► 17
► 20
► **23**
► 26

Question No: 26 (Marks: 1) - Please choose one



Which of the following is approximate area of the shaded region by taking x_1^* and x_2^* as right endpoint of equal-length subintervals?

► 8
► 10
► 12
► 14

Question No: 27 (Marks: 1) - Please choose one

What is the length of each sub-interval, if the interval [1,3] is divided into n sub-intervals of equal length?

► $\frac{1}{n}$
► $\frac{2}{n}$
► $\frac{3}{n}$
► $\frac{4}{n}$

Question No: 28 (Marks: 1) - Please choose one

Evaluate

$\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = - - - - -$

► **4**
► 2
► 1
► ∞

Question No: 29 (Marks: 1) - Please choose one

$\left\{ \frac{1}{2^n} \right\}_1^n$

represents the sequence**:**

► $\frac{-1}{2}, \frac{-1}{4}, \frac{-1}{8}, \ldots$

► $\frac{1}{2},\frac{1}{4},\frac{1}{8},\ldots$

► $0,1,\frac{1}{2},\frac{1}{4},\ldots$

► $0,1,2,3\ldots$

Question No: 30 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1}-a_n \le 0$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n}>1$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 32 (Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

► Divergent
► Convergent
► Give no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a+ar+ar^2+ar^3+\ldots+ar^{k-1}+\ldots \ \ where\ (a\neq 0)$, $|r|<1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If $\rho=\lim_{k\to+\infty}\sqrt[k]{u_k}$ where $\rho>1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

Question No: 35 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty}(-1)^{k+1}\frac{1}{k}$$

Which of the following is true for the series ?

► Arithmetic Series
► Geometric Series
► Alternating Harmonic Series
► Harmonic Series

Question No: 36 (Marks: 1) - Please choose one

.....is the special case of Tylor's theorem.

► Roll's Theorem
► Picard's Method
► Integration
► Maclaurin's Theorem

Question No: 37 (Marks: 1) - Please choose one

If f is integrable on a closed interval containing the four points *a*, *b*, *c* and *d* then

$\int_a^d f(x)dx =$ _____

► $\int_a^b f(x)\,dx+\int_b^c f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^b f(x)\,dx+\int_c^d f(x)\,dx$

► $\int_a^c f(x)\,dx+\int_b^d f(x)\,dx$

► $\int_a^d f(x)\,dx$

►

Question No: 38 (Marks: 1) - Please choose one

Suppose f and g are integrable functions on [*a*, *b*] and *c* is a constant, then

$\int_a^b c\,[f(x)+g(x)]\,dx =$ _____

$\int_a^b f(cx)dx + \int_a^b g(cx)dx$

►

$\int_a^b f(x)\,dx + \int_a^b g(x)]\,dx$

►

$c\int_a^b f(x)dx + c\int_a^b g(x)dx$

►

► 0

Question No: 39 (Marks: 1) - Please choose one

What is the difference between the values of the

$\int_a^b f(x)dx \quad and \quad \int_a^b f(t)dt$

integrals ?

► Differ by b-a
► Differ by a-b
► **No difference**
► Differ by b+a

Question No: 40 (Marks: 1) - Please choose one

$\int_{-1}^{2} f(x)\,dx = 5 \qquad \int_{-1}^{2} g(x)\,dx = -3$

If and then which of the following is value

$\int_{-1}^{2} [f(x) + 2g(x)]\,dx$

of ?

► **-1**
► -8
► 2
► 11

Question No: 41 (Marks: 2)

$\frac{1}{1} + \frac{1}{8} + \frac{1}{27} + ... + \frac{1}{1000}$

Express the sum in sigma notation.

$\sum_{n=1}^{10} (1/n^3)$

Question No: 42 (Marks: 2)

Only write down the Maclaurin series for e^x

Question No: 43 (Marks: 2)

Evaluate the following integral:

$\int_1^4 \sqrt{x}\ dx$

$\int_1^4 \sqrt{x}\,dx$

$= \int_1^4 \sqrt{x}.1dx$

$= x\sqrt{x} + \int_1^4 1/\sqrt{x}.1dx$

Question No: 44 (Marks: 3)

Evaluate the following sum:

$\sum_{k=1}^{6} (k^2 - 5)$

$= -4 - 1 + 4 + 11 + 20 + 31 = 61$

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Find a definite integral indicating the area enclosed by the curves $y = x^2 \ , \ x > 0$ and bounded on the sides by the lines $y = 1$ and $y = 4$. But do not evaluate the integral.

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$a_n = \left\{\frac{3}{n^2}\right\}_{n=5}^{\infty}$

Determine whether the following sequence is strictly monotone or not.If your answer is yes or no, then give reason .

Yes the sequence is strictly monotone because the denominator is increasing

Question No: 47 (Marks: 5)

The region bounded by the *y*-axis, the graph of the equation $x = y^{\frac{3}{2}}$ and the line *y* = 2 is revolved about *y*-axis. Find the volume of the resulting solid.

Question No: 48 (Marks: 5)

Compute the following sum:

$\sum_{i=1}^{n} \left(4i^2 - i\right) = \left(4(1)^2 - 1\right) + \left(4(2)^2 - 2\right) + \left(4(3)^2 - 3\right) + \left(4(4)^2 - 4\right) .....$

$= 3 + 14 + 33 + 60 .....$

Question No: 49 (Marks: 5)

Use L`Hopital's rule to evaluate the limit

$$\lim_{x\to\frac{\pi}{2}} \frac{1-\sin x}{1+\cos 2x}$$

$$\lim_{x\to\frac{\pi}{2}} (1-\sin x)=0 \lim_{x\to\frac{\pi}{2}} (1+\cos 2x)=0$$

$$=0/0$$

So by L'Hopital's rule

$$\lim_{x\to\frac{\pi}{2}} \frac{1-\sin x}{1+\cos 2x}$$

$$=\lim_{x\to\frac{\pi}{2}} \frac{d/dx(1-\sin x)}{d/dx(1+\cos 2x)}$$

$$=\lim_{x\to\frac{\pi}{2}} \frac{-\cos x}{-2\sin 2x}=\frac{\cos\frac{\pi}{2}}{2\sin\pi}=0$$

Question No: 50 (Marks: 10)

$$\sum_{1}^{\infty} \frac{2^n}{n(n+2)}$$

Use the Ratio test to determine whether the series converges or diverges.

$$p=\lim_{x\to\infty} \frac{u_{k+1}}{u_k}=$$

FINALTERM EXAMINATION
Fall 2009
Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

Let $f(x)$ is a function such that as x approaches a real number a, either from left or right-hand-side, the function values increases or decreases unboundedly then

$$\lim_{x\to a} f(x)$$

- ► Exist
- ► Does not exist

Question No: 2 (Marks: 1) - Please choose one

$$\frac{d(\sec x)}{dx}=$$

- ► $(\sec x)(\tan x)$
- ► $(\sec x)(\tan x)$
- ► $(co\sec x)(co\,t\,x)$
- ► $(co\sec x)(\tan x)$

Question No: 3 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then
$\frac{d}{dx}\left((c)\{h(x)\}\right) =$ _____

- 0
- $\frac{d}{dx}(h(x))$
- $\frac{d}{dx}(h(cx))$
- $c\frac{d}{dx}(h(x))$

Question No: 4 (Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x\to-\infty} f(x) = +\infty$ *and* $\lim_{x\to+\infty} f(x) = +\infty$ then f has _____ on $(-\infty,+\infty)$

- maximum value but no minimum
- minimum value but no maximum
- both maximum and minimum value

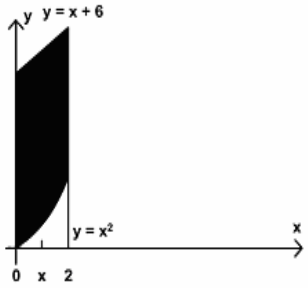
Question No: 5 (Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

- χ
- η
- Σ
- ψ

Question No: 6 (Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 7 (Marks: 1) - Please choose one

At what points the two curves: $y = x^2$ *and* $y = x + 6$ intersect ?

- $x = 0$ *and* $x = 2$
- $x = 0$ *and* $x = 3$
- $x = 2$ *and* $x = 3$
- $x = -2$ *and* $x = 3$

Question No: 8 (Marks: 1) - Please choose one

Let the solid generated by the region enclosed between $y = \sqrt{x}$; $x = 1, x = 4$ and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

- $V = \int_1^4 2\pi x\sqrt{x}dx$

$$V = \int_{1}^{4} 2x\sqrt{x}dx$$

►

$$V = \int_{0}^{4} 2x\sqrt{x}dx$$

►

$$V = \int_{-4}^{4} 2x\sqrt{x}dx$$

►

Question No: 9 (Marks: 1) - Please choose one

Let f is a smooth curve on the interval [a, b]. What is the arc length L of the curve f(x) defined over the interval [a, b]?

$$L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}$$

►

$$L = \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}\Delta x_k$$

►

$$L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))^2}\Delta x_k$$

►

$$L = \sum_{k=1}^{n} \sqrt{1 + (f(x^*_k))}\Delta x$$

►

Question No: 10 (Marks: 1) - Please choose one

For a graph to be symmetric about y-axis means, for each point (x,y) on the graph,the point ---------- is also on the graph

► (x , -y)
► (-x , y)
► (-x , -y)

Question No: 11 (Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about ---------axis

► X-axis
► Y-axis
► Origin

Question No: 12 (Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

Question No: 13 (Marks: 1) - Please choose one

Domain of the function y = $\frac{(x^2-4)}{(x-2)}$ is

► $(-\infty, 2) U (2, +\infty)$
► $(-\infty, 2)$
► $(-\infty, 0)$
►

Question No: 14 (Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

► $\pm\frac{k\pi}{2}(k = 1,3,5,...)$
► $\pm\frac{k\pi}{2}(k = 2,4,6,...)$
►

$\pm\frac{k\pi}{2}(k=1,2,3,4,5,6,...)$

▶

Question No: 15 (Marks: 1) - Please choose one

$\lim_{x\to 0}\frac{\sin x}{x}$

= ----------

▶ -1
▶ 2
▶ 0
▶ 1

Question No: 16 (Marks: 1) - Please choose one

How the series $1-3+5-7+9-11$ can be expressed in sigma notation?

$\sum_{k=0}^{k=5}(-1)^k(2k+1)$

▶

$\sum_{k=1}^{k=5}(-1)^k(2k+1)$

▶

$\sum_{k=1}^{k=5}(2k+1)$

▶

$\sum_{k=1}^{k=5}(2k+1)$

▶

Question No: 17 (Marks: 1) - Please choose one

Let the region bounded by the curve $y=\sqrt[3]{x}$, the x-axis, and the line $x=3$ is revolved about the y-axis to generate a solid. Which of the following equation gives the volume of a solid by cylindrical shells?

$V=\int_0^3 x^{\frac{3}{2}}\,dx$

▶

$V=2\pi\int_0^3\sqrt{x}\,dx$

▶

$V=\int_0^3 2\pi x\sqrt[3]{x}\,dx$

▶

$V=\int_0^3 x\sqrt[3]{x}\,dx$

▶

Question No: 18 (Marks: 1) - Please choose one

$y=\frac{2\sqrt{2}}{3}x^{\frac{3}{2}};\ 0\le x\le 2$

Let then which of the following is the length of the curve?

$L=\int_0^2\sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L=\int\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L=\int_0^2\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L=\int_0^2\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]}dx$

▶

Question No: 19 (Marks: 1) - Please choose one

$\frac{2}{3}$

is known as

- ► An even number
- ► Irrational Number
- ► A natural Number
- ► Rational Number

Question No: 20 (Marks: 1) - Please choose one

For a function *f*, let $f'(x_n)=0 \quad for\ some\ n$.

Does the Newton's Method works for approximating the solution of $f(x)=0$?

- ► Yes
- ► No

Question No: 21 (Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ..... "

- ► $f'(c)=\frac{f(b)-f(a)}{b-a}$
- ► $f(c)=\frac{f(b)-f(a)}{b-a}$
- ► $f(c)=\frac{f(a)-f(b)}{b-a}$
- ► $f'(c)=\frac{f(a)-f(b)}{b-a}$
- ►

Question No: 22 (Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)]=f(x)$$

If there is some function *F* such that then any function of the form $F(x)+C$ is ---------- of *f*(*x*)

- ► Derivative
- ► Antiderivative
- ► Slope
- ► Maximum value

Question No: 23 (Marks: 1) - Please choose one

If *f* and *g* are continues function on an interval [a, b] and $f(x)\geq g(x)\ \ for\ \ a\leq x\leq b$, then area is bounded by the lines parallel to:

- ► X -axis
- ► Y-axis
- ► Both X -axis and Y-axis

Question No: 24 (Marks: 1) - Please choose one

What is the sum of following series?

$1^3+2^3+3^3+4^3+\_\_\_\_\_+n^3$

- ► $\frac{n(2n)(2n+1)}{6}$
- ► $\frac{(n+1)(n+2)}{2}$
- ► $\left[\frac{n(n+2)}{2}\right]^2$
- ► $\left[\frac{n(n+1)}{2}\right]^2$
- ►

Question No: 25 (Marks: 1) - Please choose one

$\frac{5}{7}\times 1^2+\frac{5}{7}\times 2^2+\frac{5}{7}\times 3^2+\frac{5}{7}\times 4^2....+\frac{5}{7}\times n^2=$ _____

- ► $\frac{5n(n+1)(2n+1)}{42}$

► $\frac{5n(n+1)}{14}$

► $\frac{5n^2(n+1)^2}{14}$

► $\frac{5(n+1)(2n+1)}{42}$

►

Question No: 26 (Marks: 1) - Please choose one

$\int_a^a f(x)dx =$ _____

If point a is in the domain of function f, then

► $f'(x)$

► $f(x)$

► 0

► 1

Question No: 27 (Marks: 1) - Please choose one

If $a_1 > a_2 > a_3 > ..... > a_n > ....$, then a sequence $\{a_n\}$ is .....

► Increasing

► Nondecreasing

► Decreasing

► Nonincreasing

Question No: 28 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n \le 0$ then the sequence is known as**:**

► Increasing

► Decreasing

► Nondecreasing

► Nonincreasing

Question No: 29 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} < 1$ then the sequence is known as**:**

► Increasing

► Decreasing

► Nondecreasing

► Nonincreasing

Question No: 30 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \ge 1$ then the sequence is known as **:**

► Increasing

► Decreasing

► Nondecreasing

► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

$a_n = \left\{\frac{1}{n}\right\}_{n=1}^{\infty}$

Which of the following option is true for the sequence ?

► Increasing

► Decreasing

► Nonincreasing

► Nondecreasing

Question No: 32 (Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

► Divergent

► Convergent

► Give no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + ... + ar^{k-1} + ... \quad where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

- ► Converges
- ► Diverges
- ► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If $\rho = \lim_{k \to +\infty} \frac{u_{k+1}}{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

- ► Convergent
- ► Divergent
- ► Give no information

Question No: 35 (Marks: 1) - Please choose one

If $\rho = \lim_{k \to +\infty} \sqrt[k]{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

- ► Convergent
- ► Divergent
- ► Give no information

Question No: 36 (Marks: 1) - Please choose one

In alternating series test, which one of the following condition must be satisfied?

- ► $\lim_{k \to \infty} a_k = 1$
- ► $a_1 > a_2 > a_3 ..... > a_k > ....$
- ► $a_1 \leq a_2 \leq a_3 ..... \leq a_k \leq ....$

Question No: 37 (Marks: 1) - Please choose one

A series of the form $\sum_{k=1}^{\infty} (-1)^n a_k$ is called _____.

- ► Alternating series
- ► Geometric series
- ► Arithmetic series
- ► Harmonic series

Question No: 38 (Marks: 1) - Please choose one

Which of the following is the Maclaurin series for e^x ?

- ► $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + ... + \frac{x^k}{k!} + ...$
- ► $x + \frac{x^2}{2!} + \frac{x^3}{3!} + ... + \frac{x^k}{k!} + ...$
- ► $1 + x + \frac{x^3}{3!} + ... + \frac{x^k}{k!} + ...$
- ► $1 - x + \frac{x^3}{3!} - ... - \frac{x^k}{k!} - ...$

Question No: 39 (Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

- ► $W = \int_2^3 3x dx$
- ► $W = \int_0^3 3x dx$
- ► $W = \int_0^3 F(x) dx$

$$W = \int_{3}^{0} F(x)dx$$

►

Question No: 40 (Marks: 1) - Please choose one

Which of the following is the spring constant *k* if a spring whose natural length is 2*m* exerts a force of 3*N* when stretched 1*m* beyond its natural length?

► 3 *x*
► 3 *N/m*
► 2 *m*
► 3 *m/N*

Question No: 41 (Marks: 2)

Evaluate the following integral by substitution method.

$$\int x\,(2x^2+1)^{\frac{2}{3}}\,dx$$

Question No: 42 (Marks: 2)

Find the limits of the integral indicating the area bounded by the curves $y = x^2 \text{ and } y = x+6$.

Sol,

Question No: 43 (Marks: 2)

What will be the amount of work done if an object moves 7*m* in the direction of a force of 70*N*?

Question No: 44 (Marks: 3)

Evaluate the following integral:

$$\int \frac{5-6\sin^2 x}{\sin^2 x}\,dx$$

Question No: 45 (Marks: 3)

Find a definite integral indicating the area of the surface generated by revolving the curve $y = \sqrt[3]{3x}\ ;\quad 0 \le y \le 4$ about the $x-$ axis. But do not evaluate the integral.

Question No: 46 (Marks: 3)

Find the spring constant '*k*'; if a force of 10*N* is required to stretch a spring from its natural length of 4.8*m* to a length of 6.8*m*?

Question No: 47 (Marks: 5)

$\frac{d}{dx}[f(x)] = 12x^2 - 6x + 1$

Let . Find $f(x)$

Sol,

Question No: 48 (Marks: 5)

Use the cylindrical shell to find the volume of the solid generated when the region enclosed by the curve $y = x^3\ , x = 1,\ y = 0$ is revolved about the *y*-axis.

Question No: 49 (Marks: 5)

Determine whether the sequence $\{a_n\}$ converges or diverges; if it converges then find its limit;

$$a_n = \frac{3n^4+1}{4n^2-1}$$

where

Question No: 50 (Marks: 10)

Find the area of the region that is enclosed by the curves $y = x^2$ and $y = \sqrt{x}$ $x = \frac{1}{4} \text{ and } x = 1$ between .

FINALTERM EXAMINATION
Fall 2009
Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

Let $f(x)$ is a function such that as x approaches a real number a, either from left or right-hand-side, the function values increases or decreases unboundedly then

$\lim_{x \to a} f(x)$

- ► Exist
- ► Does not exist

Question No: 2 (Marks: 1) - Please choose one

$\frac{d(\sec x)}{dx} =$

- ► $(\sec x)(\tan x)$
- ► $(\sec x)(\tan x)$
- ► $(co\sec x)(co\,t\,x)$
- ► $(co\sec x)(\tan x)$

Question No: 3 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}((c)\{h(x)\}) =$ _____

- ► 0
- ► $\frac{d}{dx}(h(x))$
- ► $\frac{d}{dx}(h(cx))$
- ► $c\frac{d}{dx}(h(x))$

Question No: 4 (Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x \to -\infty} f(x) = +\infty$ *and* $\lim_{x \to +\infty} f(x) = +\infty$ then f has _____ on $(-\infty, +\infty)$

- ► maximum value but no minimum
- ► minimum value but no maximum
- ► both maximum and minimum value

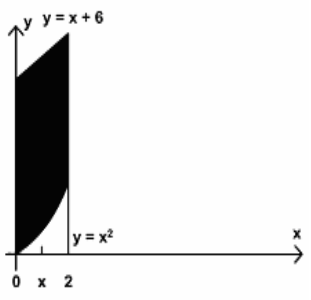
Question No: 5 (Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

- ► χ
- ► η
- ► Σ
- ► ψ

Question No: 6 (Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 7 (Marks: 1) - Please choose one

At what points the two curves: $y = x^2 \text{ and } y = x + 6$ intersect ?

- $x = 0 \text{ and } x = 2$
- $x = 0 \text{ and } x = 3$
- $x = 2 \text{ and } x = 3$
- $x = -2 \text{ and } x = 3$

Question No: 8 (Marks: 1) - Please choose one

Let the solid generated by the region enclosed between $y = \sqrt{x} \quad ; \quad x = 1, x = 4$ and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

- $V = \int_1^4 2\pi x\sqrt{x}dx$
- $V = \int_1^4 2x\sqrt{x}dx$
- $V = \int_0^4 2x\sqrt{x}dx$
- $V = \int_{-4}^4 2x\sqrt{x}dx$

Question No: 9 (Marks: 1) - Please choose one

Let f is a smooth curve on the interval [a, b]. What is the arc length L of the curve f(x) defined over the interval [a, b]?

- $L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}$
- $L = \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}\Delta x_k$
- $L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))^2}\Delta x_k$
- $L = \sum_{k=1}^{n} \sqrt{1 + (f(x^*_k))}\Delta x$

Question No: 10 (Marks: 1) - Please choose one

For a graph to be symmetric about y-axis means, for each point (x,y) on the graph,the point ---------- is also on the graph

- (x , -y)
- (-x , y)

► (-x , -y)

Question No: 11 (Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about ---------axis

► X-axis
► Y-axis
► Origin

Question No: 12 (Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

Question No: 13 (Marks: 1) - Please choose one

Domain of the function y = $\frac{(x^2-4)}{(x-2)}$ is

► $(-\infty, 2) U (2, +\infty)$
► $(-\infty, 2)$
► $(-\infty, 0)$

Question No: 14 (Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

► $\pm\frac{k\pi}{2}(k = 1, 3, 5, ...)$
► $\pm\frac{k\pi}{2}(k = 2, 4, 6, ...)$
► $\pm\frac{k\pi}{2}(k = 1, 2, 3, 4, 5, 6, ...)$
►

Question No: 15 (Marks: 1) - Please choose one

$\lim_{x\to 0}\frac{\sin x}{x}$

= ----------

► -1
► 2
► 0
► 1

Question No: 16 (Marks: 1) - Please choose one

How the series $1-3+5-7+9-11$ can be expressed in sigma notation?

► $\sum_{k=0}^{k=5}(-1)^k(2k+1)$
► $\sum_{k=1}^{k=5}(-1)^k(2k+1)$
► $\sum_{k=1}^{k=5}(2k+1)$
► $\sum_{k=1}^{k=5}(2k+1)$

Question No: 17 (Marks: 1) - Please choose one

Let the region bounded by the curve $y = \sqrt[3]{x}$, the x-axis, and the line $x = 3$ is revolved about the y-axis to generate a solid. Which of the following equation gives the volume of a solid by cylindrical shells?

$V = \int_0^3 x^{\frac{3}{2}}\,dx$

▶

$V = 2\pi\int_0^3 \sqrt{x}\,dx$

▶

$V = \int_0^3 2\pi x\sqrt[3]{x}\,dx$

▶

$V = \int_0^3 x\sqrt[3]{x}\,dx$

▶

Question No: 18 (Marks: 1) - Please choose one

Let $y = \frac{2\sqrt{2}}{3}x^{\frac{3}{2}};\ 0 \le x \le 2$ then which of the following is the length of the curve?

$L = \int_0^2 \sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L = \int \sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L = \int_0^2 \sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$

▶

$L = \int_0^2 \sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]}\,dx$

▶

Question No: 19 (Marks: 1) - Please choose one

$\frac{2}{3}$ is known as

▶ An even number
▶ Irrational Number
▶ A natural Number

▶ Rational Number

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For a function *f*, let $f'(x_n) = 0 \quad for\ some\ n$.

Does the Newton's Method works for approximating the solution of $f(x) = 0$?

▶ Yes
▶ No

Question No: 21 (Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ….. "

▶ $f'(c) = \frac{f(b)-f(a)}{b-a}$

$f(c) = \frac{f(b)-f(a)}{b-a}$

▶

$f(c) = \frac{f(a)-f(b)}{b-a}$

▶

$f'(c) = \frac{f(a)-f(b)}{b-a}$

▶

Question No: 22 (Marks: 1) - Please choose one

If there is some function *F* such that $\frac{d}{dx}[F(x)] = f(x)$ then any function of the form $F(x)+C$ is ---------- of *f*(*x*)

► Derivative
► Antiderivative
► Slope
► Maximum value

Question No: 23 (Marks: 1) - Please choose one

If f and g are continues function on an interval [a, b]
and $f(x) \geq g(x) \ \ for \ \ a \leq x \leq b$, then area is bounded by the lines parallel to:

► X -axis
► Y-axis
► Both X -axis and Y-axis

Question No: 24 (Marks: 1) - Please choose one

What is the sum of following series?

$1^3 + 2^3 + 3^3 + 4^3 + \_\_\_\_\_ + n^3$

► $\frac{n(2n)(2n+1)}{6}$

► $\frac{(n+1)(n+2)}{2}$

► $\left[\frac{n(n+2)}{2}\right]^2$

► $\left[\frac{n(n+1)}{2}\right]^2$

Question No: 25 (Marks: 1) - Please choose one

$\frac{5}{7}\times 1^2 + \frac{5}{7}\times 2^2 + \frac{5}{7}\times 3^2 + \frac{5}{7}\times 4^2 .... + \frac{5}{7}\times n^2 = \_\_\_\_\_$

► $\frac{5n(n+1)(2n+1)}{42}$

► $\frac{5n(n+1)}{14}$

► $\frac{5n^2(n+1)^2}{14}$

► $\frac{5(n+1)(2n+1)}{42}$

Question No: 26 (Marks: 1) - Please choose one

$\int_a^a f(x)dx = \_\_\_\_\_$

If point a is in the domain of function f , then

► $f'(x)$

► $f(x)$

► 0

► 1

Question No: 27 (Marks: 1) - Please choose one

If $a_1 > a_2 > a_3 > ..... > a_n > ....$, then a sequence $\{a_n\}$ is .....

► Increasing
► Nondecreasing
► Decreasing
► Nonincreasing

Question No: 28 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n \leq 0$ then the sequence is known as**:**

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For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence is known as **:**

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- ► Nondecreasing
- ► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

$$a_n = \left\{\frac{1}{n}\right\}_{n=1}^{\infty}$$

Which of the following option is true for the sequence ?

- ► Increasing
- ► Decreasing
- ► Nonincreasing
- ► Nondecreasing

Question No: 32 (Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

- ► Divergent
- ► Convergent
- ► Give no information

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If the geometric series $a + ar + ar^2 + ar^3 + ... + ar^{k-1} + ... \ \ where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

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- ► Gives no information

Question No: 34 (Marks: 1) - Please choose one

$$\rho = \lim_{k \to +\infty} \frac{u_{k+1}}{u_k}$$

If where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

- ► Convergent
- ► Divergent
- ► Give no information

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In alternating series test, which one of the following condition must be satisfied?

- ► $\lim_{k \to \infty} a_k = 1$
- ► $a_1 > a_2 > a_3 ..... > a_k > ....$
- ► $a_1 \leq a_2 \leq a_3 ..... \leq a_k \leq ....$

Question No: 37 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty} (-1)^n a_k$$

A series of the form is called _____.

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► Geometric series

► Arithmetic series

► Harmonic series

Question No: 38 (Marks: 1) - Please choose one

Which of the following is the Maclaurin series for e^x ?

► $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

► $x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

► $1+x+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

► $1-x+\frac{x^3}{3!}-\ldots-\frac{x^k}{k!}-\ldots$

►

Question No: 39 (Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

$W=\int_2^3 3x\,dx$

► $W=\int_0^3 3x\,dx$

► $W=\int_0^3 F(x)\,dx$

► $W=\int_3^0 F(x)\,dx$

►

Question No: 40 (Marks: 1) - Please choose one

Which of the following is the spring constant *k* if a spring whose natural length is 2*m* exerts a force of 3*N* when stretched 1*m* beyond its natural length?

► 3 *x*

► 3 *N/m*

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► 3 *m/N*

Question No: 41 (Marks: 2)

Evaluate the following integral by substitution method.

$\int x\,(2x^2+1)^{\frac{2}{3}}\,dx$

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Find the limits of the integral indicating the area bounded by the curves $y=x^2 \text{ and } y=x+6$.

Sol,

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$\int \frac{5-6\sin^2 x}{\sin^2 x}\,dx$

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Find the spring constant '*k*'; if a force of 10*N* is required to stretch a spring from its natural length of 4.8*m* to a length of 6.8*m*?

Question No: 47 (Marks: 5)

Let $\frac{d}{dx}[f(x)] = 12x^2 - 6x + 1$. Find $f(x)$

Sol,

Question No: 48 (Marks: 5)

Use the cylindrical shell to find the volume of the solid generated when the region enclosed by the curve $y = x^3, x = 1, y = 0$ is revolved about the *y*-axis.

Question No: 49 (Marks: 5)

Determine whether the sequence $\{a_n\}$ converges or diverges; if it converges then find its limit;

$$a_n = \frac{3n^4 + 1}{4n^2 - 1}$$

where

Question No: 50 (Marks: 10)

Find the area of the region that is enclosed by the curves $y = x^2$ and $y = \sqrt{x}$ between $x = \frac{1}{4}$ and $x = 1$.

FINALTERM EXAMINATION
Fall 2008
(Session - 1)

Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

If $y = f(x)$ then the average rate of change of y with respect to x over the interval $[x_0, x_1]$ is the ..... Joining the points $(x_0, f(x_0)) and (x_1, f(x_1))$ on the graph of f

- ► Slope of the secant line
- ► Slope of tangent line
- ► Secant line
- ► none of these

Question No: 2 (Marks: 1) - Please choose one

Natural domain of $\frac{(x^2 - 4)}{(x - 2)}$ is

- ► $(-\infty, 2) U (2, +\infty)$
- ► $(-\infty, 2)$
- ► $(-\infty, 0)$
- ► None of these

Question No: 3 (Marks: 1) - Please choose one

The equation $(x+4)^2+(y-1)^2=6$ represents a circle having center at ..... and radius .....

- ► $(-4,1),\sqrt{6}$
- ► $(-4,1),6$
- ► $(-4,-1),\sqrt{6}$
- ► None of these

Question No: 4 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that $\rho=\lim_{k\to\infty}\sqrt[k]{u_k}=\lim_{k\to\infty}(u_k)^{\frac{1}{k}}$ if $\rho>1$ then the series

- ► Converges
- ► **Diverges**
- ► May converge or diverge
- ► None of these

Question No: 5 (Marks: 1) - Please choose one

The series $\sum u_k \text{ and } \sum v_k$ are convergent series then $(\sum u_k+\sum v_k) \text{ and } (\sum u_k-\sum v_k)$ will be .....and.....

- ► Convergent, convergent
- ► Divergent, divergent
- ► **Convergent, divergent**
- ► Divergent, convergent

Question No: 6 (Marks: 1) - Please choose one

The notation $\{\frac{1}{2^n}\}_{-1}^{n}$ represents the sequence

- ► $2,1,\frac{1}{2},\frac{1}{4},...$
- ► $0,1,2,3...$
- ► $0,1,\frac{1}{2},\frac{1}{4},...$
- ►
- ► None of these

Question No: 7 (Marks: 1) - Please choose one

If f is continuous on (a,b] but does not have a limit from the right then the integral $\int_a^b f(x)dx=\lim_{l\to a}\int_l^b f(x)dx$ defined by is called ..... Integral

- ► Improper
- ► Proper
- ► None of these

Question No: 8 (Marks: 1) - Please choose one

An object is displaced 1m by a force of 1N then the work done W is

- ► 2
- ► 0
- ► None of these
- ► **1**

Question No: 9 (Marks: 1) - Please choose one

If f is a smooth function on [a,b] then the arc length L of the curve y=f(x) from x=a to x=b will be

- ► $L=\int_a^b\sqrt{1+[f'(x)]^2}dx$

$$L=\int_a^b \sqrt{1+[f'(x)]}dx$$

▶

$$L=\int_0^a \sqrt{1+[f'(x)]}dy$$

▶

▶ None of these

Question No: 10 (Marks: 1) - Please choose one

If f is a smooth function on [0,3] then the arc length L of the curve y=f(x) from x=0 to x=3 will be

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}dx$$

▶

$$L=\int_a^b \sqrt{1+[f'(x)]^2}$$

▶

$$L=\int_0^3 \sqrt{1+[f'(x)]^2}dy$$

▶

▶ None of these

Question No: 11 (Marks: 1) - Please choose one

By using cylindrical shell to find volume of the solid when the region R in the first quadrant enclosed between $y=3x \text{ and } y=2x^2$ is revolved about the x-axis

$$V=\int_0^{\frac{3}{2}} 2\pi x(3x-2x^2)dx$$

▶

$$V=\int_0^{\frac{3}{2}} x(3x-2x^2)dx$$

▶

$$V=\int_0^{\frac{3}{2}} 2\pi(3x-2x^2)dx$$

▶

▶ None of these

Question No: 12 (Marks: 1) - Please choose one

By using cylindrical shell to find volume of the solid when the region R in the first quadrant enclosed between $y=x \text{ and } y=x^2$ is revolved about the y-axis is represented by

$$V=\int_0^3 2\pi x(x-x^2)dx$$

▶

$$V=\int_0^1 x(x-x^2)dx$$

▶

$$V=\int_0^1 2\pi(x-x^2)dx$$

▶

▶ None of these

Question No: 13 (Marks: 1) - Please choose one

If

$$\int_a^a f(x)dx=$$

a is in the domain of f, then

▶ $f'(x)$

▶ $f(x)$

► **0**
► None of these

Question No: 14 (Marks: 1) - Please choose one

$\int_0^2 x^2 dx$

Consider the integral , the area on right is bounded by

► $y = x^2$
► $x = 2$
► $x = 0$
► None of these

Question No: 15 (Marks: 1) - Please choose one

The series $1-3+5-7+9-11$ may written as in sigma notation

► $\sum_{k=0}^{k=5}(-1)^k(2k+1)$
► $\sum_{k=1}^{k=5}(-1)^k(2k+1)$
► $\sum_{k=1}^{k=5}(2k+1)$
► None of these

Question No: 16 (Marks: 1) - Please choose one

$4^2+5^2+6^2+7^2$ in sigma notation may be represented as

► $\sum_{k=2}^{k=7} k^2$
► $\sum_{k=2}^{k=7}(k+1)^2$
► $\sum_{k=4}^{k=7} k^2$
► None of these

Question No: 17 (Marks: 1) - Please choose one

If a function f is ..... on a closed interval [a,b] ,then f has both a maximum and minimum value on [a,b]

► **Continuous**
► Discontinuous
► Differentiable
► None of these

Question No: 18 (Marks: 1) - Please choose one

Let f be a function on an interval, and $x_1 \text{ and } x_2$ denote the points in that interval, if $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then the we can say that f is

► Increasing function
► **Decreasing function**
► Constant function
► None of these

Question No: 19 (Marks: 1) - Please choose one

If a function satisfies the conditions

f(c) is defined

$\lim_{x \to c^+} f(x)$

Exists

$\lim_{x \to c^+} f(x) = f(c)$

Then the function is said to be

► **Continuous at c**
► Continuous from left at c
► Continuous from right at c
► None of these

Question No: 20 (Marks: 1) - Please choose one

For a function f(x) to be continuous on interval (a,b) the function must be continuous

► **At all point in (a,b)**
► Only at a and b
► At mid point of a and b
► None of these

Question No: 21 (Marks: 2)

$$a_{n+1} = \frac{1}{3}(a_n + \frac{1}{a_n}) \; for \; n \geq 1 \; and \; a_1 = 2$$

Write down the first two term of the sequence

Question No: 22 (Marks: 2)

Find the integral of the surface area of the portion of the sphere generated by revolving the

$$y = \sqrt{2 - x^2}, 0 \leq x \leq \frac{1}{3}$$

curve
(Note: Just find the integral do not solve the integral)

Question No: 23 (Marks: 2)

$$\int_2^5 f(x)dx \quad \int_2^3 f(x)dx = 7, \int_3^4 f(x)dx = 2, \int_5^4 f(x)dx = 5$$

Calculate if

$$\int_2^3 f(x)dx = 7, \int_3^4 f(x)dx = 2, \int_5^4 f(x)dx = 5$$
$$\int_2^5 f(x)dx = 7 + 2 - 5 = 4$$

Question No: 24 (Marks: 3)

Find the first two Taylor polynomials for $\ln x$ about $x = 3$

Question No: 25 (Marks: 3)

Let the curve $y = x^{\frac{3}{2}} \; ; \quad 0 \leq y \leq 2$, then find the surface area generated by revolving the curve. (But do not evaluate)

Question No: 26 (Marks: 3)

$$\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + ... + \frac{1}{7225}$$

Express the sum in sigma notation but do not evaluate.

$$\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + ... + \frac{1}{7225}$$
$$\sum_{k=1}^{7225} k^3 + 1$$

Question No: 27 (Marks: 5)

Find the first four nonzero terms of the Taylor series generated by f at $x = a$

$$f(x) = \frac{1}{1-x} \quad at \quad x = 2$$

Question No: 28 (Marks: 5)

Evaluate the Definite Integral using the First fundamental Theorem of Calculus

$$\int_0^1 (x^5 - x^3 + 2x)dx$$

$$Let\ u = (x^5 - x^3 + 2x)$$

$$\int_0^1 (u)dx$$

Question No: 29 (Marks: 5)

Express the definite integrals as limits (Do not evaluate the integrals)

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + Cosx)\,dx$$

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + Cosx)\,dx$$

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \lim_{\max \Delta x_k \to 0} \sum_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (1 + \cos x)dx$$

Question No: 30 (Marks: 10)

Find the region enclosed by the curves and also find the area

$y = x^2$, $y = \sqrt{x}$, $x = \frac{1}{4}$, $x = 1$

Question No: 31 (Marks: 10)

Use x^*_k as the left end point of each subinterval to find the area under

$y = mx \ \ over\ the \text{int} erval\ [a,b], where\ m > 0\ and\ a \geq 0$

Solution on next page

$Suppose \ \ a = 1\ b = 2\ so [a,b] = [1,2]$

$x_k^* = x_{k-1} = a + (k-1)\Delta x \quad (formula\ for\ left\ end\ po\text{int})$

$$\Delta x = \frac{b-a}{n} = \frac{2-1}{n} = \frac{1}{n}$$

$Suppose\ \ kth\ has\ area$

$f(x_{k*})\Delta x = x_{k*}\Delta x$

$$\left[1 + \frac{k}{n}\right]\Delta x$$

$$\left[1 + \frac{k}{n}\right]\frac{1}{n}$$

$$\sum_{k=1}^{n} f(x_{k*})\Delta x = \sum_{k=1}^{n}\left[1 + k - 1\right]$$

$Area\ by\ solving$

$$A = \lim_{\delta x \to 0} \sum_{k=1}^{n} f(x_{k*})\Delta x = \lim_{\delta x \to 0}\left[\frac{3}{2} - 1 + \frac{1}{2n}\right]$$

$$= \frac{3}{2} - 1 + 0$$

FINALTERM EXAMINATION 2009
(Session - 2)

Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

According to Power-Rule of differentiation, if $f(x) = x^n$ where n is a real number, then

$\frac{d}{dx}[x^n] =$

- ▶ x^{n-1}
- ▶ $n\,x^{n-1}$
- ▶ $n\,x^{n+1}$
- ▶ $(n-1)x^{n+1}$

Question No: 2 (Marks: 1) - Please choose one

If a function g is differentiable at a point x and a function f is differentiable at a point g(x), then the _____ is differentiable at point x .

- ▶ Composition (f o g)
- ▶ Quotient (f / g)
- ▶ Product (f . g)
- ▶ Sum (f + g)

Question No: 3 (Marks: 1) - Please choose one

$y = f\left(g\left(h(x)\right)\right)$

If

$u = g\left(h(x)\right)$

$v = h(x)$ then $\frac{dy}{dx} =$ _____

- ▶ $\frac{dy}{du}.\frac{du}{dv}.\frac{dv}{dx}$
- ▶ $\frac{dy}{du}\frac{du}{dv}\frac{dv}{dx}$
- ▶ $\frac{dv}{du}.\frac{du}{dv}.\frac{dy}{dx}$

Question No: 4 (Marks: 1) - Please choose one

If a function f is ..... on a closed interval [a,b] , then f has both maximum and minimum value on [a,b].

- ▶ Continuous
- ▶ Discontinuous
- ▶ None of these

Question No: 5 (Marks: 1) - Please choose one

$$\int_a^x \frac{t^2}{2}dt$$

The expression , represents a function of :

- ▶ t
- ▶ a
- ▶ Both x and a
- ▶ x

Question No: 6 (Marks: 1) - Please choose one

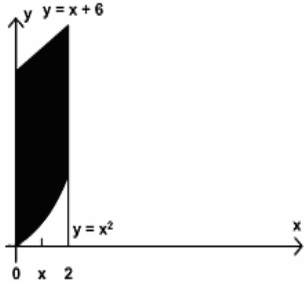
$\int cf(x)dx =$ _____

if c is a constant

- 0
- c
- $\int f(cx)dx$
- $c\int f(x)dx$

Question No: 7 (Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 8 (Marks: 1) - Please choose one

At what points the two curves: $y = x^2 \text{ and } y = x + 6$ intersect ?

- $x = 0 \text{ and } x = 2$
- $x = 0 \text{ and } x = 3$
- $x = 2 \text{ and } x = 3$
- $x = -2 \text{ and } x = 3$

Question No: 9 (Marks: 1) - Please choose one

What is the sum of following series?

$1 + 2 + 3 + 4 + \_\_\_\_\_ + n$

- $\frac{n+1}{2}$
- $\frac{(n+1)(n+2)}{2}$
- $\frac{n(n+2)}{2}$
- $\frac{n(n+1)}{2}$

Question No: 10 (Marks: 1) - Please choose one

$If\ b > 0\ then\ \frac{d}{dx}[b^x] =$ _____

- 0
- xb^{x-1}
- $\ln b$
- $b^x \ln b$

Question No: 11 (Marks: 1) - Please choose one

Let S be a solid bounded by two parallel planes perpendicular to the x-axis at x = a and x = b .If , for each x in [a,b], the cross-section area of S perpendicular to the x-axis is A(x) ,then what is the volume of the solid?

- $V = \int_a^b A(y)dx$
- $V = \int_a^b A(x)dx$

$V = \int_{0}^{A(x)} [b-a]dx$

►

$V = \int_{0}^{A(x)} [b+a]dx$

►

Question No: 12 (Marks: 1) - Please choose one

Let the solid generated by the region enclosed between $y = \sqrt{x} \quad ; \quad x = 1, x = 4$ and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

► $V = \int_{1}^{4} 2\pi x\sqrt{x}dx$

►

$V = \int_{1}^{4} 2x\sqrt{x}dx$

►

$V = \int_{0}^{4} 2x\sqrt{x}dx$

►

$V = \int_{-4}^{4} 2x\sqrt{x}dx$

►

Question No: 13 (Marks: 1) - Please choose one

If slope m of a none vertical line is m =1 then the angle of inclination of the line is

► $\frac{\pi}{4}$

►

$\frac{\pi}{2}$

►

$\frac{\pi}{5}$

►

Question No: 14 (Marks: 1) - Please choose one

The PYTHAGORAS theorem describes the relationship between the sides of .....

► Right angle triangle
► Isoceleous triangle
► Equilateral triangle

Question No: 15 (Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

Question No: 16 (Marks: 1) - Please choose one

The graph of the equation $y = x^2 - 4x + 5$ will represent

► Parabola
► Straight line
► Two straight lines

► Ellipse

Question No: 17 (Marks: 1) - Please choose one

$\lim_{x \to a} f(x) = ...where\ f(x) = k$

The (k is a constant)

► k+2
► k+1
► k

Question No: 18 (Marks: 1) - Please choose one

$$\int \frac{1}{x^2+2}\, dx$$

Consider the indefinite integral

Let $t = x^2 + 2$

Is the following substitution correct?

$$\int \frac{1}{x^2+2}\, dx = \int \frac{1}{t}\, dt$$

► Yes
► No

Question No: 19 (Marks: 1) - Please choose one

$\log_b \frac{1}{t} =$ _____

► $\log_b t$
► $1 - \log_b t$
► $1 + \log_b t$
► $-\log_b t$

Question No: 20 (Marks: 1) - Please choose one

How the series $1-3+5-7+9-11$ can be expressed in sigma notation?

► $\sum_{k=0}^{k=5} (-1)^k (2k+1)$
► $\sum_{k=1}^{k=5} (-1)^k (2k+1)$
► $\sum_{k=1}^{k=5} (2k+1)$
► $\sum_{k=1}^{k=5} (2k+1)$

Question No: 21 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$$

The sum is known as:

► Riemann Sum
► General Sum
► Integral Sum
► Geometric Sum

Question No: 22 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$$

What does 'n' represent in the Riemann Sum ?

► No. of Circles
► No. of Subintervals
► No. of Loops
► No. of Squares

Question No: 23 (Marks: 1) - Please choose one

If w and v are continuous functions of y on an interval [c, d]
and $w(y) \geq v(y) \ \ for \ c \leq y \leq d$, then area is bounded by the lines parallel to: **:**

► Y-axis
► X-axis
► Both X-axis and Y-axis

Question No: 24 (Marks: 1) - Please choose one

How the series $2(1)+2(2)+2(3)+2(4)+2(5)$ can be expressed in sigma notation?

- $\sum_{k=0}^{5} 2k^2$
- $\sum_{k=1}^{5} 2k^2$
- $\sum_{k=0}^{5} 2k$
- $\sum_{k=1}^{5} 2k$

Question No: 25 (Marks: 1) - Please choose one

$\sum_{k=1}^{n} \frac{k^3}{2} =$ _____

- $\frac{n(n+1)}{4}$
- $\frac{[n(n+1)]^2}{8}$
- $\frac{n(n+1)(2n+1)}{12}$
- $\frac{(n+1)(2n+1)}{6}$

Question No: 26 (Marks: 1) - Please choose one

If $a_1 < a_2 < a_3 < ..... < a_n < ....$, then a sequence $\{a_n\}$ is.....

- Nondecreasing
- Decreasing
- Increasing
- Nonincreasing

Question No: 27 (Marks: 1) - Please choose one

If $a_1 \geq a_2 \geq a_3 \geq ..... \geq a_n \geq ....$, then a sequence $\{a_n\}$ is .....

- Increasing
- Nondecreasing
- Decreasing
- Nonincreasing

Question No: 28 (Marks: 1) - Please choose one

If the difference between successive terms $a_{n+1} - a_n > 0$ then the sequence $\{a_n\}$ is known as**:**

- Increasing
- Decreasing
- Nondecreasing
- Nonincreasing

Question No: 29 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} > 1$ then the sequence is known as**:**

- Increasing
- Decreasing
- Nondecreasing
- Nonincreasing

Question No: 30 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence is known as **:**

- Increasing
- Decreasing
- Nondecreasing

► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

If $f(n) = a_n$ is the nth term of the sequence and $f(n)$ is differentiable and $f'(n) > 0$ then the sequence will be**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 32 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + \ldots + ar^{k-1} + \ldots \ \ where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + \ldots + ar^{k-1} + \ldots \ \ where\ (a \neq 0)$ $|r| \geq 1$, then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If the series $\sum_{k=1}^{\infty} u_k$ converges but the series $\sum_{k=1}^{\infty} |u_k|$ does not converge , then $\sum_{k=1}^{\infty} u_k$ will _____

► Converge absolutely
► Diverge
► Converge conditionally

Question No: 35 (Marks: 1) - Please choose one

Let $\sum u_k$ be a series with nonzero terms and suppose that $\rho = \lim_{k\to\infty} \frac{|u_{k+1}|}{|u_k|} > 1$ then which of the following is true?

► The series $\sum |u_k|$ converges
► The series $\sum |u_k|$ diverges
► No conclusion can be drawn.

Question No: 36 (Marks: 1) - Please choose one

Suppose f and g are integrable functions on [*a*, *b*] and *c* is a constant, then $\int_a^b c\,[f(x) + g(x)]\,dx =$ _____

► $\int_a^b f(cx)dx + \int_a^b g(cx)dx$
► $\int_a^b f(x)\,dx + \int_a^b g(x)]\,dx$
► $c\int_a^b f(x)dx + c\int_a^b g(x)dx$
► 0

Question No: 37 (Marks: 1) - Please choose one

Which of the following is surface area S generated by revolving the curve *y = f(x)* between *x = 0* and *x = 2* about the *x*-axis?

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f(x)]}dx$$

▶

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f'(x)]^2}dx$$

▶

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f'(x)]}dx$$

▶

$$S=\int_0^2 2\sqrt{1+[f'(x)]}dx$$

▶

Question No: 38 (Marks: 1) - Please choose one

Which of the following is area of the surface generated by revolving the curve $y=4\sqrt{x}\ ;\ 1\le x\le 4$ about the *x*-axis?

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)\right]^2}\,dx$$

▶

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]}\,dx$$

▶

$$\int_1^4 2\pi+\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]^2}\,dx$$

▶

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]^2}\,dx$$

▶

Question No: 39 (Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

$$W=\int_2^3 3xdx$$

▶

$$W=\int_0^3 3xdx$$

▶

$$W=\int_0^3 F(x)dx$$

▶

$$W=\int_3^0 F(x)dx$$

▶

Question No: 40 (Marks: 1) - Please choose one

If $\int_1^0 f(x)\,dx=2$ and $\int_0^5 f(x)\,dx=1$ then which of the following is value of $\int_1^5 f(x)\,dx$?

▶ -3
▶ -1
▶ 1
▶ 3

Question No: 41 (Marks: 2)

Derivative of a function is $\frac{1}{2\sqrt{x}}$. Find the original function.

Question No: 42 (Marks: 2)

If $\sum u_k$ is a series with positive terms and $\rho=\lim_{k\to+\infty}\sqrt[k]{u_k}$; then write the three cases for the series to be convergent, divergent or none.

Question No: 43 (Marks: 2)

Evaluate the following integral:

$$\int_1^3 \frac{1}{x^2}\,dx$$

Question No: 44 (Marks: 3)

Use the first fundamental theorem of calculus to evaluate the definite integral:

$$\int_0^2 f(x)\,dx \qquad where \qquad f(x)=\begin{cases} x^2 & ; \quad 0\le x<1 \\ x^3 & ; \quad 1\le x\le 2 \end{cases}$$

Question No: 45 (Marks: 3)

$$\sum_{k=2}^{\infty}(-1)^{k-1}\frac{2^{k-1}}{(k-1)!}$$

Show that the series converges absolutely.

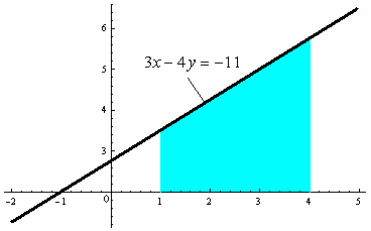
Question No: 46 (Marks: 3)

Express the following definite integral as limit of Riemann Sum. (Do not evaluate the integral)

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} Cos\,x\,dx$$

Question No: 47 (Marks: 5)

Express area of the shaded region as a definite integral.



Question No: 48 (Marks: 5)

How much work is required to wind the chain onto the pulley if a 100-ft length of steel chain weighting
15 lb/ ft. is dangling from a pulley?

Question No: 49 (Marks: 5)

Evaluate the following integral:

$$\int_1^2 \frac{x^2+\sqrt{x}}{x^2}\,dx$$

Question No: 50 (Marks: 10)

Use L'Hopital's Rule to evaluate

$$\lim_{x\to 0}(1+\sin x)^{\cot x}$$

FINALTERM EXAMINATION 2009
(Session - 2)

Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

According to Power-Rule of differentiation, if $f(x) = x^n$ where n is a real number, then

$\frac{d}{dx}[x^n] =$

- ▶ x^{n-1}
- ▶ $n\,x^{n-1}$
- ▶ $n\,x^{n+1}$
- ▶ $(n-1)x^{n+1}$

Question No: 2 (Marks: 1) - Please choose one

If a function g is differentiable at a point x and a function f is differentiable at a point g(x), then the _____ is differentiable at point x .

- ▶ Composition (f o g)
- ▶ Quotient (f / g)
- ▶ Product (f . g)
- ▶ Sum (f + g)

Question No: 3 (Marks: 1) - Please choose one

$y = f\left(g\left(h(x)\right)\right)$

If

$u = g\left(h(x)\right)$

$v = h(x)$ then $\frac{dy}{dx} =$ _____

- ▶ $\frac{dy}{du}.\frac{du}{dv}.\frac{dv}{dx}$
- ▶ $\frac{dy}{du}\frac{du}{dv}\frac{dv}{dx}$
- ▶ $\frac{dv}{du}.\frac{du}{dv}.\frac{dy}{dx}$

Question No: 4 (Marks: 1) - Please choose one

If a function f is ..... on a closed interval [a,b] , then f has both maximum and minimum value on [a,b].

- ▶ Continuous
- ▶ Discontinuous
- ▶ None of these

Question No: 5 (Marks: 1) - Please choose one

$$\int_a^x \frac{t^2}{2}dt$$

The expression , represents a function of :

- ▶ t
- ▶ a
- ▶ Both x and a
- ▶ x

Question No: 6 (Marks: 1) - Please choose one

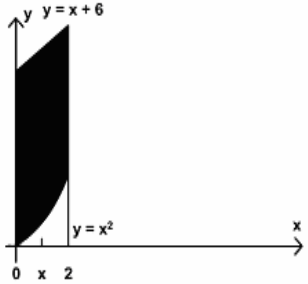
$\int cf(x)dx =$ _____

if c is a constant

- 0
- c
- $\int f(cx)dx$
- $c\int f(x)dx$

Question No: 7 (Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 8 (Marks: 1) - Please choose one

At what points the two curves: $y = x^2 \text{ and } y = x + 6$ intersect ?

- $x = 0 \text{ and } x = 2$
- $x = 0 \text{ and } x = 3$
- $x = 2 \text{ and } x = 3$
- $x = -2 \text{ and } x = 3$

Question No: 9 (Marks: 1) - Please choose one

What is the sum of following series?

$1 + 2 + 3 + 4 + \_\_\_\_\_ + n$

- $\frac{n+1}{2}$
- $\frac{(n+1)(n+2)}{2}$
- $\frac{n(n+2)}{2}$
- $\frac{n(n+1)}{2}$

Question No: 10 (Marks: 1) - Please choose one

$If\ b > 0\ then\ \frac{d}{dx}[b^x] =$ _____

- 0
- xb^{x-1}
- $\ln b$
- $b^x \ln b$

Question No: 11 (Marks: 1) - Please choose one

Let S be a solid bounded by two parallel planes perpendicular to the x-axis at x = a and x = b .If , for each x in [a,b], the cross-section area of S perpendicular to the x-axis is A(x) ,then what is the volume of the solid?

- $V = \int_a^b A(y)dx$
- $V = \int_a^b A(x)dx$

$V = \int_{0}^{A(x)} [b-a]dx$

►

$V = \int_{0}^{A(x)} [b+a]dx$

►

Question No: 12 (Marks: 1) - Please choose one

Let the solid generated by the region enclosed between $y = \sqrt{x} \quad ; \quad x = 1, x = 4$ and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

► $V = \int_{1}^{4} 2\pi x\sqrt{x}dx$

►

$V = \int_{1}^{4} 2x\sqrt{x}dx$

►

$V = \int_{0}^{4} 2x\sqrt{x}dx$

►

$V = \int_{-4}^{4} 2x\sqrt{x}dx$

►

Question No: 13 (Marks: 1) - Please choose one

If slope m of a none vertical line is m =1 then the angle of inclination of the line is

► $\frac{\pi}{4}$

►

$\frac{\pi}{2}$

►

$\frac{\pi}{5}$

►

Question No: 14 (Marks: 1) - Please choose one

The PYTHAGORAS theorem describes the relationship between the sides of .....

► Right angle triangle
► Isoceleous triangle
► Equilateral triangle

Question No: 15 (Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

Question No: 16 (Marks: 1) - Please choose one

The graph of the equation $y = x^2 - 4x + 5$ will represent

► Parabola
► Straight line
► Two straight lines

► Ellipse

Question No: 17 (Marks: 1) - Please choose one

$\lim_{x \to a} f(x) = ...where\ f(x) = k$

The (k is a constant)

► k+2
► k+1
► k

Question No: 18 (Marks: 1) - Please choose one

$$\int \frac{1}{x^2+2}\, dx$$

Consider the indefinite integral

Let $t = x^2 + 2$

Is the following substitution correct?

$$\int \frac{1}{x^2+2}\, dx = \int \frac{1}{t}\, dt$$

► Yes
► No

Question No: 19 (Marks: 1) - Please choose one

$\log_b \frac{1}{t} =$ _____

► $\log_b t$
► $1 - \log_b t$
► $1 + \log_b t$
► $-\log_b t$

Question No: 20 (Marks: 1) - Please choose one

How the series $1-3+5-7+9-11$ can be expressed in sigma notation?

► $\sum_{k=0}^{k=5} (-1)^k (2k+1)$
► $\sum_{k=1}^{k=5} (-1)^k (2k+1)$
► $\sum_{k=1}^{k=5} (2k+1)$
► $\sum_{k=1}^{k=5} (2k+1)$

Question No: 21 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$$

The sum is known as:

► Riemann Sum
► General Sum
► Integral Sum
► Geometric Sum

Question No: 22 (Marks: 1) - Please choose one

$$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$$

What does 'n' represent in the Riemann Sum ?

► No. of Circles
► No. of Subintervals
► No. of Loops
► No. of Squares

Question No: 23 (Marks: 1) - Please choose one

If w and v are continuous functions of y on an interval [c, d]
and $w(y) \geq v(y) \ \ for \ c \leq y \leq d$, then area is bounded by the lines parallel to: **:**

► Y-axis
► X-axis
► Both X-axis and Y-axis

Question No: 24 (Marks: 1) - Please choose one

How the series $2(1)+2(2)+2(3)+2(4)+2(5)$ can be expressed in sigma notation?

- $\sum_{k=0}^{5} 2k^2$
- $\sum_{k=1}^{5} 2k^2$
- $\sum_{k=0}^{5} 2k$
- $\sum_{k=1}^{5} 2k$

Question No: 25 (Marks: 1) - Please choose one

$\sum_{k=1}^{n} \frac{k^3}{2} =$ _____

- $\frac{n(n+1)}{4}$
- $\frac{[n(n+1)]^2}{8}$
- $\frac{n(n+1)(2n+1)}{12}$
- $\frac{(n+1)(2n+1)}{6}$

Question No: 26 (Marks: 1) - Please choose one

If $a_1 < a_2 < a_3 < ..... < a_n < ....$, then a sequence $\{a_n\}$ is.....

- Nondecreasing
- Decreasing
- Increasing
- Nonincreasing

Question No: 27 (Marks: 1) - Please choose one

If $a_1 \geq a_2 \geq a_3 \geq ..... \geq a_n \geq ....$, then a sequence $\{a_n\}$ is .....

- Increasing
- Nondecreasing
- Decreasing
- Nonincreasing

Question No: 28 (Marks: 1) - Please choose one

If the difference between successive terms $a_{n+1} - a_n > 0$ then the sequence $\{a_n\}$ is known as**:**

- Increasing
- Decreasing
- Nondecreasing
- Nonincreasing

Question No: 29 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} > 1$ then the sequence is known as**:**

- Increasing
- Decreasing
- Nondecreasing
- Nonincreasing

Question No: 30 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence is known as **:**

- Increasing
- Decreasing
- Nondecreasing

► Nonincreasing

Question No: 31 (Marks: 1) - Please choose one

If $f(n) = a_n$ is the nth term of the sequence and $f(n)$ is differentiable and $f'(n) > 0$ then the sequence will be**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 32 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + \ldots + ar^{k-1} + \ldots \ \ where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 33 (Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + \ldots + ar^{k-1} + \ldots \ \ where\ (a \neq 0)$ $|r| \geq 1$, then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

Question No: 34 (Marks: 1) - Please choose one

If the series $\sum_{k=1}^{\infty} u_k$ converges but the series $\sum_{k=1}^{\infty} |u_k|$ does not converge , then $\sum_{k=1}^{\infty} u_k$ will _____

► Converge absolutely
► Diverge
► Converge conditionally

Question No: 35 (Marks: 1) - Please choose one

Let $\sum u_k$ be a series with nonzero terms and suppose that $\rho = \lim_{k\to\infty} \frac{|u_{k+1}|}{|u_k|} > 1$ then which of the following is true?

► The series $\sum |u_k|$ converges
► The series $\sum |u_k|$ diverges
► No conclusion can be drawn.

Question No: 36 (Marks: 1) - Please choose one

Suppose f and g are integrable functions on [*a*, *b*] and *c* is a constant, then $\int_a^b c\,[f(x) + g(x)]\,dx =$ _____

► $\int_a^b f(cx)dx + \int_a^b g(cx)dx$
► $\int_a^b f(x)\,dx + \int_a^b g(x)]\,dx$
► $c\int_a^b f(x)dx + c\int_a^b g(x)dx$
► 0

Question No: 37 (Marks: 1) - Please choose one

Which of the following is surface area S generated by revolving the curve *y = f(x)* between *x = 0* and *x = 2* about the *x*-axis?

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f(x)]}dx$$

▶

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f'(x)]^2}dx$$

▶

$$S=\int_0^2 2\pi f(x)\sqrt{1+[f'(x)]}dx$$

▶

$$S=\int_0^2 2\sqrt{1+[f'(x)]}dx$$

▶

Question No: 38 (Marks: 1) - Please choose one

Which of the following is area of the surface generated by revolving the curve $y=4\sqrt{x}\ ;\ 1\le x\le 4$ about the *x*-axis?

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)\right]^2}\,dx$$

▶

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]}\,dx$$

▶

$$\int_1^4 2\pi+\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]^2}\,dx$$

▶

$$\int_1^4 2\pi\left(4\sqrt{x}\right)\sqrt{1+\left[\left(4\sqrt{x}\right)'\right]^2}\,dx$$

▶

Question No: 39 (Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

$$W=\int_2^3 3xdx$$

▶

$$W=\int_0^3 3xdx$$

▶

$$W=\int_0^3 F(x)dx$$

▶

$$W=\int_3^0 F(x)dx$$

▶

Question No: 40 (Marks: 1) - Please choose one

If $\int_1^0 f(x)\,dx=2$ and $\int_0^5 f(x)\,dx=1$ then which of the following is value of $\int_1^5 f(x)\,dx$?

▶ -3
▶ -1
▶ 1
▶ 3

Question No: 41 (Marks: 2)

Derivative of a function is $\frac{1}{2\sqrt{x}}$. Find the original function.

Question No: 42 (Marks: 2)

If $\sum u_k$ is a series with positive terms and $\rho=\lim_{k\to+\infty}\sqrt[k]{u_k}$; then write the three cases for the series to be convergent, divergent or none.

Question No: 43 (Marks: 2)

Evaluate the following integral:

$$\int_1^3 \frac{1}{x^2}\,dx$$

Question No: 44 (Marks: 3)

Use the first fundamental theorem of calculus to evaluate the definite integral:

$$\int_0^2 f(x)\,dx \qquad where \qquad f(x)=\begin{cases} x^2 & ; \quad 0\le x<1 \\ x^3 & ; \quad 1\le x\le 2 \end{cases}$$

Question No: 45 (Marks: 3)

$$\sum_{k=2}^{\infty}(-1)^{k-1}\frac{2^{k-1}}{(k-1)!}$$

Show that the series converges absolutely.

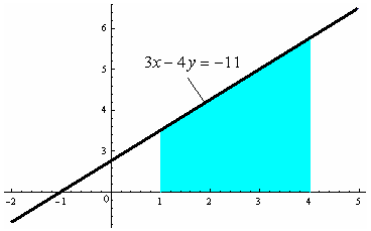
Question No: 46 (Marks: 3)

Express the following definite integral as limit of Riemann Sum. (Do not evaluate the integral)

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} Cos\,x\,dx$$

Question No: 47 (Marks: 5)

Express area of the shaded region as a definite integral.



Question No: 48 (Marks: 5)

How much work is required to wind the chain onto the pulley if a 100-ft length of steel chain weighting
15 lb/ ft. is dangling from a pulley?

Question No: 49 (Marks: 5)

Evaluate the following integral:

$$\int_1^2 \frac{x^2+\sqrt{x}}{x^2}\,dx$$

Question No: 50 (Marks: 10)

Use L'Hopital's Rule to evaluate

$$\lim_{x\to 0}(1+\sin x)^{\cot x}$$

FINALTERM EXAMINATION
(Session - 4)

Calculus & Analytical Geometry-I

(Marks: 1) - Please choose one

Let the region bounded by the curve $y = \sqrt[3]{x}$, the x-axis, and the line $x = 3$ is revolved about the y-axis to generate a solid. Which of the following equation gives the volume of a solid by cylindrical shells?

$V = \int_0^3 x^{\frac{3}{2}}\, dx$

► $V = 2\pi \int_0^3 \sqrt{x}\, dx$

► $V = \int_0^3 2\pi x \sqrt[3]{x}\, dx$

► $V = \int_0^3 x \sqrt[3]{x}\, dx$

►

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n \le 0$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} < 1$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

(Marks: 1) - Please choose one

If $\rho = \lim_{k \to +\infty} \sqrt[k]{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

(Marks: 1) - Please choose one

In alternating series test, which one of the following condition must be satisfied?

► $\lim_{k \to \infty} a_k = 1$

► $a_1 > a_2 > a_3 ..... > a_k > ....$

► $a_1 \le a_2 \le a_3 ..... \le a_k \le ....$

(Marks: 1) - Please choose one

Let $y = \frac{2\sqrt{2}}{3} x^{\frac{3}{2}};\ 0 \le x \le 2$ then which of the following is the length of the curve?

$$L=\int_0^2\sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$$

▶

$$L=\int\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$$

▶

$$L=\int_0^2\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]^2}\,dx$$

▶

$$L=\int_0^2\sqrt{1+\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}}\right)\right]}\,dx$$

▶

(Marks: 1) - Please choose one

$\frac{2}{3}$

is known as

▶ An even number
▶ Irrational Number
▶ A natural Number

▶ Rational Number

(Marks: 1) - Please choose one

For a function *f*, let $f'(x_n)=0 \quad for\ some\ n$.

Does the Newton's Method works for approximating the solution of $f(x)=0$?

▶ Yes
▶ No

(Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ……. "

▶ $f'(c)=\frac{f(b)-f(a)}{b-a}$

$f(c)=\frac{f(b)-f(a)}{b-a}$

▶

$f(c)=\frac{f(a)-f(b)}{b-a}$

▶

$f'(c)=\frac{f(a)-f(b)}{b-a}$

▶

(Marks: 1) - Please choose one

If there is some function *F* such that $\frac{d}{dx}[F(x)]=f(x)$ then any function of the form $F(x)+C$ is ---------- of *f*(*x*)

▶ Derivative
▶ Antiderivative
▶ Slope
▶ Maximum value

(Marks: 1) - Please choose one

If *f* and *g* are continues function on an interval [a, b] and $f(x)\geq g(x)\ \ for\ \ a\leq x\leq b$, then area is bounded by the lines parallel to:

▶ X -axis
▶ Y-axis
▶ Both X -axis and Y-axis

(Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

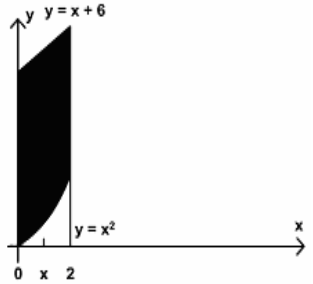
▶ χ
▶ η

▶ Σ

▶ ψ

(Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



▶ $y = x + 6$

▶ $y = x^2$

▶ $x = 2$

▶ $x = 0$

(Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}((c)\{h(x)\}) =$ _____

▶ 0

▶ $\frac{d}{dx}(h(x))$

▶ $\frac{d}{dx}(h(cx))$

▶ $c\frac{d}{dx}(h(x))$

(Marks: 1) - Please choose one

Let the solid generated by the region enclosed between

$y = \sqrt{x} \quad ; \quad x = 1, x = 4$

and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

▶ $V = \int_1^4 2\pi x\sqrt{x}dx$

▶ $V = \int_1^4 2x\sqrt{x}dx$

▶ $V = \int_0^4 2x\sqrt{x}dx$

▶ $V = \int_{-4}^4 2x\sqrt{x}dx$

(Marks: 1) - Please choose one

Let f is a smooth curve on the interval [a, b]. What is the arc length L of the curve f(x) defined over the interval [a, b]?

▶ $L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}$

▶ $L = \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))}\Delta x_k$

▶ $L = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} \sqrt{1 + (f'(x^*_k))^2}\Delta x_k$

▶ $L = \sum_{k=1}^{n} \sqrt{1 + (f(x^*_k))}\Delta x$

(Marks: 1) - Please choose one

Let $f(x)$ is a function such that as x approaches a real number a, either from left or right-hand-side, the function values increases or decreases unboundedly then

$\lim_{x \to a} f(x)$

- ► Exist
- ► Does not exist

(Marks: 1) - Please choose one

$\frac{d(\sec x)}{dx} =$

- ► $(\sec x)(\tan x)$
- ► $(\sec x)(\tan x)$
- ► $(co\sec x)(co\,t\,x)$
- ► $(co\sec x)(\tan x)$

(Marks: 1) - Please choose one

At what points the two curves: $y = x^2 \; and \; y = x + 6$ intersect ?

- ► $x = 0 \; and \; x = 2$
- ► $x = 0 \; and \; x = 3$
- ► $x = 2 \; and \; x = 3$
- ► $x = -2 \; and \; x = 3$

(Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x \to -\infty} f(x) = +\infty \;\; and \;\; \lim_{x \to +\infty} f(x) = +\infty$ then f has _____ on $(-\infty, +\infty)$

- ► maximum value but no minimum
- ► minimum value but no maximum
- ► both maximum and minimum value

For a graph to be symmetric about y-axis means, for each point (x,y) on the graph,the point ---------- is also on the graph

- ► (x , -y)
- ► (-x , y)
- ► (-x , -y)

(Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about ---------axis

- ► X-axis
- ► Y-axis
- ► Origin

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence is known as **:**

- ► Increasing
- ► Decreasing
- ► Nondecreasing
- ► Nonincreasing

(Marks: 1) - Please choose one

$$a_n = \left\{\frac{1}{n}\right\}_{n=1}^{\infty}$$

Which of the following option is true for the sequence ?

- ► Increasing
- ► Decreasing
- ► Nonincreasing
- ► Nondecreasing

(Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

► Divergent
► Convergent
► Give no information

(Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + ... + ar^{k-1} + ... \ \ where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

(Marks: 1) - Please choose one

If $\rho = \lim_{k \to +\infty} \frac{u_{k+1}}{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

(Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

(Marks: 1) - Please choose one

Domain of the function $y = \frac{(x^2-4)}{(x-2)}$ is

► $(-\infty, 2) U (2, +\infty)$
► $(-\infty, 2)$
► $(-\infty, 0)$

(Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

► $\pm\frac{k\pi}{2}(k = 1,3,5,...)$
► $\pm\frac{k\pi}{2}(k = 2,4,6,...)$
► $\pm\frac{k\pi}{2}(k = 1,2,3,4,5,6,...)$
►

(Marks: 1) - Please choose one

$Lim_{x \to 0} \frac{\sin x}{x}$ = ----------

► -1
► 2
► 0
► 1

(Marks: 1) - Please choose one

How the series $1 - 3 + 5 - 7 + 9 - 11$ can be expressed in sigma notation?

► $\sum_{k=0}^{k=5} (-1)^k (2k+1)$
► $\sum_{k=1}^{k=5} (-1)^k (2k+1)$
►

$\sum_{k=1}^{k=5}(2k+1)$

▶

$\sum_{k=1}^{k=5}(2k+1)$

▶

(Marks: 1) - Please choose one

What is the sum of following series?

$1^3+2^3+3^3+4^3+\_\_\_\_\_+n^3$

$\frac{n(2n)(2n+1)}{6}$

▶

$\frac{(n+1)(n+2)}{2}$

▶

$\left[\frac{n(n+2)}{2}\right]^2$

▶

$\left[\frac{n(n+1)}{2}\right]^2$

▶

(Marks: 1) - Please choose one

$\frac{5}{7}\times1^2+\frac{5}{7}\times2^2+\frac{5}{7}\times3^2+\frac{5}{7}\times4^2....+\frac{5}{7}\times n^2=$ _____

$\frac{5n(n+1)(2n+1)}{42}$

▶

$\frac{5n(n+1)}{14}$

▶

$\frac{5n^2(n+1)^2}{14}$

▶

$\frac{5(n+1)(2n+1)}{42}$

▶

(Marks: 1) - Please choose one

$\int_a^a f(x)dx=$ _____

If point a is in the domain of function f, then

▶ $f'(x)$

▶ $f(x)$

▶ 0

▶ 1

(Marks: 1) - Please choose one

If $a_1>a_2>a_3>.....>a_n>....$, then a sequence $\{a_n\}$ is .....

▶ Increasing

▶ Nondecreasing

▶ Decreasing

▶ Nonincreasing

(Marks: 1) - Please choose one

$\sum_{k=1}^{\infty}(-1)^n a_k$

A series of the form is called _____.

▶ Alternating series

▶ Geometric series

▶ Arithmetic series

▶ Harmonic series

(Marks: 1) - Please choose one

Which of the following is the Maclaurin series for e^x ?

$1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

►

$x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

►

$1+x+\frac{x^3}{3!}+\ldots+\frac{x^k}{k!}+\ldots$

►

$1-x+\frac{x^3}{3!}-\ldots-\frac{x^k}{k!}-\ldots$

►

(Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

$W=\int_2^3 3xdx$

►

$W=\int_0^3 3xdx$

►

$W=\int_0^3 F(x)dx$

►

$W=\int_3^0 F(x)dx$

►

(Marks: 1) - Please choose one

Which of the following is the spring constant *k* if a spring whose natural length is 2*m* exerts a force of 3*N* when stretched 1*m* beyond its natural length?

► 3 *x*

► 3 *N/m*

► 2 *m*

► 3 *m/N*

(Marks: 2)

Find the limits of the integral indicating the area bounded by the curves $y=x^2 \text{ and } y=x+6$.

(Marks: 2)

What will be the amount of work done if an object moves 7*m* in the direction of a force of 70*N*?

(Marks: 2)

Evaluate the following integral by substitution method.

$\int x\,(2x^2+1)^{\frac{2}{3}}\,dx$

(Marks: 3)

Evaluate the following integral:

$\int \frac{5-6\sin^2 x}{\sin^2 x}\,dx$

(Marks: 3)

Find the spring constant '*k*'; if a force of 10*N* is required to stretch a spring from its natural length of 4.8*m* to a length of 6.8*m*?

(Marks: 3)

Find a definite integral indicating the area of the surface generated by revolving the curve $y=\sqrt[3]{3x}\ ;\ 0\le y\le 4$ about the *x* – axis. But do not evaluate the integral.

(Marks: 5)

Let $\frac{d}{dx}[f(x)]=12x^2-6x+1$. Find $f(x)$

(Marks: 5)

Determine whether the sequence $\{a_n\}$ converges or diverges; if it converges then find its limit;

$a_n=\frac{3n^4+1}{4n^2-1}$

where

(Marks: 5)

Use the cylindrical shell to find the volume of the solid generated when the region enclosed by the curve $y = x^3, x = 1, y = 0$ is revolved about the *y*-axis.

(Marks: 10)

Find the area of the region that is enclosed by the curves $y = x^2$ and $y = \sqrt{x}$ between $x = \frac{1}{4}$ and $x = 1$.

FINALTERM EXAMINATION
(Session - 4)

Calculus & Analytical Geometry-I

(Marks: 1) - Please choose one

Let the region bounded by the curve $y = \sqrt[3]{x}$, the x-axis, and the line $x = 3$ is revolved about the y-axis to generate a solid. Which of the following equation gives the volume of a solid by cylindrical shells?

$V = \int_0^3 x^{\frac{3}{2}} dx$

▶

$V = 2\pi \int_0^3 \sqrt{x}\, dx$

▶

$V = \int_0^3 2\pi x \sqrt[3]{x}\, dx$

▶

$V = \int_0^3 x \sqrt[3]{x}\, dx$

▶

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n \leq 0$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} < 1$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

(Marks: 1) - Please choose one

If $\rho = \lim_{k \to +\infty} \sqrt[k]{u_k}$ where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

(Marks: 1) - Please choose one

In alternating series test, which one of the following condition must be satisfied?

► $\lim_{k \to \infty} a_k = 1$
► $a_1 > a_2 > a_3 ..... > a_k > ....$
► $a_1 \le a_2 \le a_3 ..... \le a_k \le ....$

(Marks: 1) - Please choose one

Let $y = \frac{2\sqrt{2}}{3} x^{\frac{3}{2}} ;\ 0 \le x \le 2$ then which of the following is the length of the curve?

► $L = \int_0^2 \sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2} dx$
► $L = \int \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2} dx$
► $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2} dx$
► $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]} dx$
►

(Marks: 1) - Please choose one

$\frac{2}{3}$ is known as

► An even number
► Irrational Number
► A natural Number
► Rational Number

(Marks: 1) - Please choose one

For a function *f*, let $f'(x_n) = 0 \quad for\ some\ n$.

Does the Newton's Method works for approximating the solution of $f(x) = 0$?

► Yes
► No

(Marks: 1) - Please choose one

The Mean Value Theorem states that "Let function *f* be differentiable on (a,b) and continuous on [a, b], then there exist at least one point c in (a,b) where ..... "

- ▶ $f'(c)=\frac{f(b)-f(a)}{b-a}$
- $f(c)=\frac{f(b)-f(a)}{b-a}$
- ▶ $f(c)=\frac{f(a)-f(b)}{b-a}$
- ▶ $f'(c)=\frac{f(a)-f(b)}{b-a}$
- ▶

(Marks: 1) - Please choose one

$$\frac{d}{dx}[F(x)]=f(x)$$

If there is some function *F* such that then any function of the form $F(x)+C$ is ---------- of $f(x)$

- ▶ Derivative
- ▶ Antiderivative
- ▶ Slope
- ▶ Maximum value

(Marks: 1) - Please choose one

If *f* and *g* are continues function on an interval [a, b] and $f(x)\geq g(x)\ \ for\ \ a\leq x\leq b$, then area is bounded by the lines parallel to:

- ▶ X -axis
- ▶ Y-axis
- ▶ Both X -axis and Y-axis

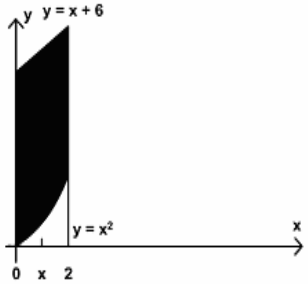
(Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

- ▶ χ
- ▶ η
- ▶ Σ
- ▶ ψ

(Marks: 1) - Please choose one

In the following figure, the area enclosed is bounded below by **:**



- $y=x+6$
- ▶ $y=x^2$
- ▶ $x=2$
- ▶ $x=0$

(Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then $\frac{d}{dx}\left((c)\{h(x)\}\right)=$ _____

- ▶ 0
- $\frac{d}{dx}(h(x))$
- ▶ $\frac{d}{dx}(h(cx))$
- ▶ $c\frac{d}{dx}(h(x))$

(Marks: 1) - Please choose one

Let the solid generated by the region enclosed between

$y=\sqrt{x}$; $x=1, x=4$ and the x-axis is revolved about the y-axis. Which of the following equation gives the volumes of a solid by cylindrical shells?

- $V=\int_{1}^{4} 2\pi x\sqrt{x}dx$ ▶
- $V=\int_{1}^{4} 2x\sqrt{x}dx$ ▶
- $V=\int_{0}^{4} 2x\sqrt{x}dx$ ▶
- $V=\int_{-4}^{4} 2x\sqrt{x}dx$ ▶

(Marks: 1) - Please choose one

Let f is a smooth curve on the interval [a, b]. What is the arc length L of the curve f(x) defined over the interval [a, b]?

- $L=\lim_{\max \Delta x\to 0}\sum_{k=1}^{n}\sqrt{1+(f'(x^*_k))}$ ▶
- $L=\sum_{k=1}^{n}\sqrt{1+(f'(x^*_k))}\Delta x_k$ ▶
- $L=\lim_{\max \Delta x\to 0}\sum_{k=1}^{n}\sqrt{1+(f'(x^*_k))^2}\Delta x_k$ ▶
- $L=\sum_{k=1}^{n}\sqrt{1+(f(x^*_k))}\Delta x$ ▶

(Marks: 1) - Please choose one

Let $f(x)$ is a function such that as x approaches a real number a, either from left or right-hand-side, the function values increases or decreases unboundedly then

$\lim_{x\to a} f(x)$

- ▶ Exist
- ▶ Does not exist

(Marks: 1) - Please choose one

$\frac{d(\sec x)}{dx}=$

- $(\sec x)(\tan x)$ ▶
- $(\sec x)(\tan x)$ ▶
- $(co\sec x)(co\tan x)$ ▶
- $(co\sec x)(\tan x)$ ▶

(Marks: 1) - Please choose one

At what points the two curves: $y=x^2$ *and* $y=x+6$ intersect ?

- $x=0$ *and* $x=2$ ▶
- $x=0$ *and* $x=3$ ▶
- $x=2$ *and* $x=3$ ▶
- $x=-2$ *and* $x=3$ ▶

(Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x\to-\infty} f(x)=+\infty$ *and* $\lim_{x\to+\infty} f(x)=+\infty$ then f has _____ on $(-\infty,+\infty)$

- ▶ maximum value but no minimum
- ▶ minimum value but no maximum
- ▶ both maximum and minimum value

For a graph to be symmetric about y-axis means, for each point (x,y) on the graph,the point ---------- is also on the graph

► (x , -y)
► (-x , y)
► (-x , -y)

(Marks: 1) - Please choose one

The graph $x = y^2$ is symmetric about ---------axis

► X-axis
► Y-axis
► Origin

(Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence is known as **:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

(Marks: 1) - Please choose one

$$a_n = \left\{\frac{1}{n}\right\}_{n=1}^{\infty}$$

Which of the following option is true for the sequence ?

► Increasing
► Decreasing
► Nonincreasing
► Nondecreasing

(Marks: 1) - Please choose one

If the partial sum of a series is finite then the series will/will be**:**

► Divergent
► Convergent
► Give no information

(Marks: 1) - Please choose one

If the geometric series $a + ar + ar^2 + ar^3 + ... + ar^{k-1} + ... \ \ where\ (a \neq 0)$, $|r| < 1$ then which of the following is true for the given series?

► Converges
► Diverges
► Gives no information

(Marks: 1) - Please choose one

$\rho = \lim_{k \to +\infty} \frac{u_{k+1}}{u_k}$

If where $\rho > 1$ then the series $\sum u_k$ with positive terms will /will be.....?

► Convergent
► Divergent
► Give no information

(Marks: 1) - Please choose one

If a quantity y depends on another quantity x in such a way that each value of x determines exactly one value of y , we say that y is ..... of x

► relation
► function
► not a function
► not a relation

(Marks: 1) - Please choose one

Domain of the function y = $\frac{(x^2-4)}{(x-2)}$ is

► $(-\infty, 2) U (2, +\infty)$
► $(-\infty, 2)$

▶ $(-\infty, 0)$

(Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

▶ $\pm\frac{k\pi}{2}(k=1,3,5,...)$

▶ $\pm\frac{k\pi}{2}(k=2,4,6,...)$

▶ $\pm\frac{k\pi}{2}(k=1,2,3,4,5,6,...)$

(Marks: 1) - Please choose one

$\lim_{x\to 0}\frac{\sin x}{x}$

= ----------

▶ -1
▶ 2
▶ 0
▶ 1

(Marks: 1) - Please choose one

How the series $1-3+5-7+9-11$ can be expressed in sigma notation?

▶ $\sum_{k=0}^{k=5}(-1)^k(2k+1)$

▶ $\sum_{k=1}^{k=5}(-1)^k(2k+1)$

▶ $\sum_{k=1}^{k=5}(2k+1)$

▶ $\sum_{k=1}^{k=5}(2k+1)$

(Marks: 1) - Please choose one

What is the sum of following series?

$1^3+2^3+3^3+4^3+\_\_\_\_\_+n^3$

▶ $\frac{n(2n)(2n+1)}{6}$

▶ $\frac{(n+1)(n+2)}{2}$

▶ $\left[\frac{n(n+2)}{2}\right]^2$

▶ $\left[\frac{n(n+1)}{2}\right]^2$

(Marks: 1) - Please choose one

$\frac{5}{7}\times 1^2+\frac{5}{7}\times 2^2+\frac{5}{7}\times 3^2+\frac{5}{7}\times 4^2....+\frac{5}{7}\times n^2 =$ _____

▶ $\frac{5n(n+1)(2n+1)}{42}$

▶ $\frac{5n(n+1)}{14}$

$\frac{5n^2(n+1)^2}{14}$

▶

$\frac{5(n+1)(2n+1)}{42}$

▶

(Marks: 1) - Please choose one

$\int_a^a f(x)dx = \_\_\_\_\_$

If point a is in the domain of function f, then

▶ $f'(x)$

▶ $f(x)$

▶ 0

▶ 1

(Marks: 1) - Please choose one

If $a_1 > a_2 > a_3 > ..... > a_n > ....$, then a sequence $\{a_n\}$ is .....

▶ Increasing

▶ Nondecreasing

▶ Decreasing

▶ Nonincreasing

(Marks: 1) - Please choose one

$\sum_{k=1}^{\infty}(-1)^n a_k$

A series of the form is called _____.

▶ Alternating series

▶ Geometric series

▶ Arithmetic series

▶ Harmonic series

(Marks: 1) - Please choose one

Which of the following is the Maclaurin series for e^x ?

$1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$

▶

$x+\frac{x^2}{2!}+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$

▶

$1+x+\frac{x^3}{3!}+...+\frac{x^k}{k!}+...$

▶

$1-x+\frac{x^3}{3!}-...-\frac{x^k}{k!}-...$

▶

(Marks: 1) - Please choose one

Which of the following is the work done *W* if an object moves in the positive direction along a coordinate line while subject to a force *F(x)* in the direction of motion over an interval [0,3]?

$W=\int_2^3 3xdx$

▶

$W=\int_0^3 3xdx$

▶

$W=\int_0^3 F(x)dx$

▶

$W=\int_3^0 F(x)dx$

▶

(Marks: 1) - Please choose one

Which of the following is the spring constant *k* if a spring whose natural length is 2*m* exerts a force of 3*N* when stretched 1*m* beyond its natural length?

▶ 3 *x*

▶ 3 *N/m*

▶ 2 *m*

► 3 *m/N*

(Marks: 2)

Find the limits of the integral indicating the area bounded by the curves $y = x^2 \text{ and } y = x + 6$.

(Marks: 2)

What will be the amount of work done if an object moves 7*m* in the direction of a force of 70*N*?

(Marks: 2)

Evaluate the following integral by substitution method.

$$\int x\,(2x^2+1)^{\frac{2}{3}}\,dx$$

(Marks: 3)

Evaluate the following integral:

$$\int \frac{5-6\sin^2 x}{\sin^2 x}\,dx$$

(Marks: 3)

Find the spring constant '*k*'; if a force of 10*N* is required to stretch a spring from its natural length of 4.8*m* to a length of 6.8*m*?

(Marks: 3)

Find a definite integral indicating the area of the surface generated by revolving the curve $y = \sqrt[3]{3x} \;;\; 0 \le y \le 4$ about the $x-$ axis. But do not evaluate the integral.

(Marks: 5)

Let $\frac{d}{dx}[f(x)] = 12x^2 - 6x + 1$. Find $f(x)$

(Marks: 5)

Determine whether the sequence $\{a_n\}$ converges or diverges; if it converges then find its limit;

$$a_n = \frac{3n^4+1}{4n^2-1}$$

where

(Marks: 5)

Use the cylindrical shell to find the volume of the solid generated when the region enclosed by the curve $y = x^3 \,, x = 1,\; y = 0$ is revolved about the *y*-axis.

(Marks: 10)

Find the area of the region that is enclosed by the curves $y = x^2$ and $y = \sqrt{x}$ $x = \frac{1}{4} \text{ and } x = 1$ between .

FINALTERM EXAMINATION 2009
(Session - 1)

Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative ..... At x_0

- ► Minima
- ► Maxima
- ► None of these

Question No: 2 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative ..... At x_0

- ► Minima
- ► Maxima
- ► None of these

Question No: 3 (Marks: 1) - Please choose one

$\lim_{x \to 0} \frac{\sin 2x}{x} = -----$

- ► 2
- ► 4
- ► 1
- ► ∞

Question No: 4 (Marks: 1) - Please choose one

$\lim_{x \to 0^+} \frac{\ln x}{1/x} = -----$

- ► 1
- ► 0
- ► e
- ► None of these

Question No: 5 (Marks: 1) - Please choose one

$\frac{d(\tan x)}{dx} =$

- ► $\sec x$
- ► $\sec^2 x$
- ► $co\sec x$
- ► $co\sec^2 x$

Question No: 6 (Marks: 1) - Please choose one

If $xy = 4$ then $\frac{dy}{dx} =$

- ► 0
- ► $\frac{-1}{x^2}$
- ► $\frac{4}{x^2}$
- ► $\frac{-4}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}\left((c)\{h(x)\}\right) =$ _____

- ► 0
- ► $\frac{d}{dx}\left(h(x)\right)$
- ► $\frac{d}{dx}\left(h(cx)\right)$
- ► $c\frac{d}{dx}\left(h(x)\right)$

Question No: 8 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$\frac{d}{dx}[f][g] =$

- ► $\frac{[f'][g]-[f][g']}{g^2}$
- ► $[f'][g']$
- ► $[f'][g]+[f][g']$
- ► $[f'][g]-[f][g']$

Question No: 9 (Marks: 1) - Please choose one

The power rule, $\frac{d}{dx}[x^n] = nx^{n-1}$ holds if n is _____

- ► An integer
- ► A rational number
- ► An irrational number
- ► All of the above

Question No: 10 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denotes two distinct points in that interval. If $f(x_1) = f(x_2)$ for all points x_1 and x_2 then which of the following statement is correct?

- ► f is a decreasing function
- ► f is an increasing function
- ► f is a constant function

Question No: 11 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then which of the following statement is correct?

- ► f is concave up on (a, b).
- ► f is concave down on (a, b)
- ► f is linear on (a, b).

Question No: 12 (Marks: 1) - Please choose one

$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$

What does 'n' represent in Riemann Sum ?

- ► No. of Circles
- ► No. of Rectangles
- ► No. of Loops
- ► No. of Squares

Question No: 13 (Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x\to-\infty} f(x) = +\infty$ *and* $\lim_{x\to+\infty} f(x) = +\infty$ then f has _____ on $(-\infty, +\infty)$

- ► maximum value but no minimum
- ► minimum value but no maximum
- ► both maximum and minimum value

Question No: 14 (Marks: 1) - Please choose one

$\int_2^t \frac{x^2}{2}dx$

The expression , represents a function of :

- ► t
- ► x
- ► 2
- ► Both t and x

Question No: 15 (Marks: 1) - Please choose one

$\int cf(x)dx = \_\_\_\_\_$

if c is a constant

- 0
- c
- $\int f(cx)dx$
- $c\int f(x)dx$

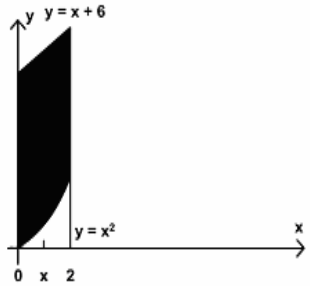
Question No: 16 (Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

- χ
- η
- Σ
- ψ

Question No: 17 (Marks: 1) - Please choose one

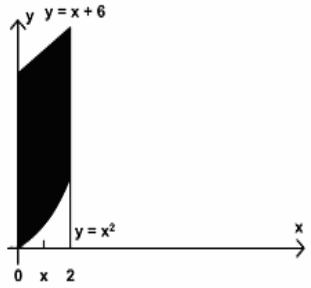
In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 18 (Marks: 1) - Please choose one

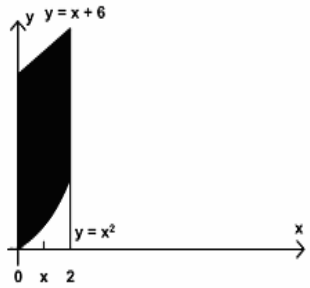
In the following figure, the area bounded on the sides by the lines are **:**



- $x = 0$
- $x = 2$
- $x = 0 \text{ and } x = 2$
- $x = 6$

Question No: 19 (Marks: 1) - Please choose one

What is the area of the region in the following figure?



- $A = \int_0^2 \left[(x+6) - (x^2) \right] dx$
- $A = \int_x^2 \left[(x+6) - (x^2) \right] dx$

$$A=\int_0^2\left[(x+6)+(x^2)\right]dx$$

▶

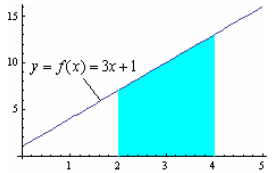
$$A=\int_0^x\left[(x+6)-(x^2)\right]dx$$

▶

Question No: 20 (Marks: 1) - Please choose one

Which of the following is approximate area under the curve $y=f(x)=3x+1$ over the interval $[2, 4]$, evaluated by using the formula

$$Area=f(x_1^*)\,\Delta x+f(x_2^*)\,\Delta x$$



If the interval $[2, 4]$ is divided into two sub-intervals of equal length and x_1^* and x_2^* are left endpoint of each sub-interval.

▶ 17
▶ 20
▶ 23

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Which of the following is approximate area under the curve $y=f(x)=2x+3$ over the interval $[0, 2]$, evaluated by using the formula

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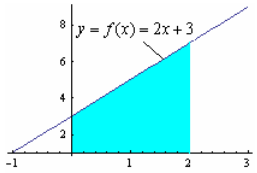

If the interval $[0, 2]$ is divided into two sub-intervals of equal length and x_1^* and x_2^* are right endpoint of each sub-interval.

▶ 8
▶ 10
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Question No: 22 (Marks: 1) - Please choose one

$If\ x>0\ then\ \frac{d}{dx}[\ln x]\ =$ _____

▶ 1
▶ x
▶ $\frac{1}{x}$
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Suppose f and g are integrable functions on [a,b] and c is a constant, then $\int_a^b c\,[f(x)+g(x)]\,dx=$ _____

▶ $\int_a^b f(cx)dx+\int_a^b g(cx)dx$

▶ $\int_a^b f(x)\,dx+\int_a^b g(x)]\,dx$

▶ $c\int_a^b f(x)dx+c\int_a^b g(x)dx$

▶ 0

Question No: 24 (Marks: 1) - Please choose one

If the function f is continuous on [a,b] and if $f(x)\geq 0$ for all x in [a,b], then which of the following gives area under the curve $y=f(x)$ over the interval [a,b]?

$\lim_{x\to\infty}\sum_{k=1}^{n}[x_k][f(x_k)]$ *where n is number of subdivisions of* $[a,b]$

▶

▶ $\int_a^b f(x)\,dx$

▶ $\pi[radius]^2$

▶ (Width) (Height)

Question No: 25 (Marks: 1) - Please choose one

Let region R in the first quadrant enclosed between $y = 3x \quad and \quad y = 2x^2$ is revolved about the
x-axis .Which of the following equation gives the volume of a solid by cylindrical shells?

$V = \int_0^{\frac{3}{2}} 2\pi x(3x - 2x^2)dx$

►

$V = \int_0^{\frac{3}{2}} x(3x - 2x^2)dx$

►

$V = \int_0^{\frac{3}{2}} 2\pi(3x - 2x^2)dx$

►

$V = \int_{-1}^{\frac{3}{2}} 2\pi(3x - 2x^2)dx$

►

Question No: 26 (Marks: 1) - Please choose one

Let f is a smooth function on [a, b]. What will be the arc length L of the curve y = f(x) from x = a to x = b?

$L = \int_b^a \sqrt{1 + [f'(x)]}dy$

►

$L = \int_a^b \sqrt{1 + [f'(x)]^2}dx$

►

$L = \int_0^a \sqrt{1 + [f'(x)]}dy$

►

$L = \int_a^b \sqrt{1 + [f'(x)]}dx$

►

Question No: 27 (Marks: 1) - Please choose one

If f is continuous on (a, b] but does not have a limit from the right then the

$$\int_a^b f(x)dx = \lim_{l \to a} \int_l^b f(x)dx$$

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For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} > 1$ then the sequence is known as**:**

► Increasing
► Decreasing
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For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} < 1$ then the sequence is known as**:**

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Question No: 30 (Marks: 1) - Please choose one

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx$$

Consider the indefinite integral

Let $t = x^3+2x^2+x-3$

Is the following substitution correct?

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx = \int \frac{1}{t}\,dt$$

- ► Yes
- ► No

Question No: 31 (Marks: 1) - Please choose one

$$\rho = \lim_{k\to\infty} \frac{u_{k+1}}{u_k}$$

The series $\sum u_k$ be a series with positive terms and suppose that if $\rho = 1$, then which of the following is true?

- ► Converges
- ► Diverges
- ► May converges or diverges
- ► Gives no information

Question No: 32 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that

$\rho = \lim_{k\to\infty} \sqrt[k]{u_k} = \lim_{k\to\infty} (u_k)^{\frac{1}{k}}$ if $\rho = 1$, then which of the following is true?

- ► Converges
- ► Diverges
- ► May converges or diverges
- ► Gives no information

Question No: 33 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty} |u_k| = |u_1| + |u_2| + |u_3| + \ldots |u_k| + \ldots$$

If the series converges , then which of

$$\sum_{k=1}^{\infty} u_k = u_1 + u_2 + u_2 + \ldots u_k + \ldots$$

the following is true for ?

- ► Converges
- ► Diverges
- ► Gives no information

Question No: 34 (Marks: 1) - Please choose one

$$\rho = \lim_{k\to\infty} \frac{|u_{k+1}|}{|u_k|}$$

Let $\sum u_k$ be a series with nonzero terms and suppose that if $\rho = +\infty$, then which of the following is true?

- ► Then the series $\sum u_k$ diverges
- ► The series $\sum u_k$ converges absolutely and therefore converges
- ► May converges or diverges
- ► Gives no information

Question No: 35 (Marks: 1) - Please choose one

$$\int_{-1}^{1} (x-1)\,dx = \_\_\_\_\_$$

- ► -2
- ► 0
- ► 2
- ► 4

Question No: 36 (Marks: 1) - Please choose one

How many critical points exist for a function f if

$f'(x) = (x-3)(x-2)$

- Zero
- One
- Two
- Four

Question No: 37 (Marks: 1) - Please choose one

$\log_b ac =$ _____

- $\log_b a + \log_b c$
- $\log_b a - \log_b c$
- $\frac{\log_b a}{\log_b c}$
- $(\log_b a)(\log_b c)$

Question No: 38 (Marks: 1) - Please choose one

$\log_b a^r =$ _____

- $a \log_b r$
- $r \log_b a$
- $\frac{\log_b a}{\log_b r}$
- $\log_b a + \log_b r$

Question No: 39 (Marks: 1) - Please choose one

$y = \frac{2\sqrt{2}}{3} x^{\frac{3}{2}}$; $0 \le x \le 2$

Let then which of the following is the length of the curve?

- $L = \int_0^2 \sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$

Question No: 40 (Marks: 1) - Please choose one

Which of the following are *first two* terms for the Taylor series of $f(x) = e^{-x}$ at $x = 0$?

- $1 + (1)(x-0)$
- $1 + (-1)(x+0)$
- $1 + (-1)(x-0)$
- $(-1)(x-0)$

Question No: 41 (Marks: 2)

$$\int_2^3 (1-x)dx$$

Evaluate the integral

$$\int_2^3 (1-x)dx$$
$$= |\, x - x^2 \frac{1}{2} |_2^3$$
$$= \frac{1}{2} |\, 2x - x^2 \,|_2^3$$
$$= \frac{1}{2}(2(3-2)-(3-2)^2)$$
$$= \frac{1}{2}(2-1)$$
$$= \frac{1}{2}$$

Question No: 42 (Marks: 2)

$$\int_2^{+\infty} \frac{dx}{x^2}$$

Evaluate the improper integral

Question No: 43 (Marks: 2)

A function $f(x) = x^2 - 4x - 9$ has critical point 2 in an interval [0, 5]. Find the maximum value of the function and point having this value.

Question No: 44 (Marks: 3)

$$\int \frac{5 - 6\sin^2 x}{\sin^2 x} dx$$

Evaluate:

$$\int \frac{5 - 6\sin^2 x}{\sin^2 x} dx$$

Question No: 45 (Marks: 3)

Find the area of the region bounded by the curve $y = x^2 \;,\; x > 0$, and bounded on the sides by the lines $y = 1$ and $y = 4$

$y = x^2 \;,\; x > 0$

So we have

$$A = \int_1^4 x^2 dx$$
$$= |\, \frac{x^3}{3} |_1^4$$
$$= \frac{1}{3}(4-1)^3$$
$$= \frac{1}{3}(3)^3$$
$$= 9$$

Question No: 46 (Marks: 3)

Determine whether the following sequence converges or diverges. If it converges, find the limit.

$$\lim_{n \to \infty} \frac{5n^2 - 1}{20n + 7n^2}$$

Question No: 47 (Marks: 5)

Use the Alternating series Test to determine whether the given series converges

$$\sum_1^{\infty} \frac{(-1)^{n-1} \cdot n!}{2^n}$$

Question No: 48 (Marks: 5)

Evaluate the integral

$$\int_{\frac{\pi}{2}}^{0} \frac{1 + \cos 2t}{2} dt$$

Solution

$$\int_{\frac{\pi}{2}}^{0} \frac{1+\cos 2t}{2} dt$$

$u = 2t$

$\frac{du}{dt} = 2dt$

$du = 2dt$

so

$$= \frac{1}{4}\int_{\frac{\pi}{2}}^{0} 1+\cos u du$$

$$= \frac{1}{4} | u + \sin u |_{\frac{\pi}{2}}^{0}$$

$$= \frac{1}{4} | 2t + \sin 2t |_{\frac{\pi}{2}}^{0}$$

$$= \frac{1}{4}(2\frac{\pi}{2} + \sin 2\frac{\pi}{2})$$

$$= \frac{1}{4}(\pi + \sin \pi)$$

$$= \frac{1}{4}(\pi + 0)$$

$$= \frac{\pi}{4}$$

Question No: 49 (Marks: 5)

Evaluate the sums

$$\sum_{k=1}^{5} k(3k+5)$$

$$= 1(3+5) + 2(6+5) + 3(9+5) + 4(12+5) + 5(15+5)$$

$$= 8 + 22 + 3(45) + 4(60) + 5(75)$$

$$= 8 + 22 + 135 + 240 + 375$$

$$= 780$$

Question No: 50 (Marks: 10)

Find the volume of the solid that results when the region enclosed by the given curves is revolved about the x – axis**.**

$y = 1 + x^3$, $x = 1, x = 2, y = 0$

from $V = \int_{a}^{b} \pi[f(x)]^2 dx$

$$V = \int_{1}^{2} \pi[1 + x^3]^2 dx$$

$$V = \int_{1}^{2} \pi[1 + x^5 + 2x^3] dx$$

$$V = \pi \int_{1}^{2} (1 + x^5 + 2x^3) dx$$

$$V = \pi | (x + \frac{1}{6}x^6 + \frac{1}{2}x^4) |_1^2$$

$$V = \pi((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4)$$

$$V = \pi\{((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4)\}$$

$$V = \pi((1) + \frac{1}{6} + \frac{1}{2}))$$

$$V = \frac{\pi(6+1+3)}{6}$$

$$V = \frac{\pi(10)}{6} = \pi\frac{5}{3}$$

This paper is solved by our best knowledge. In the case of any error/correction/suggestion, please contact at gulshanvu@yahoo.com, with reference to the concerned paper's number.

FINALTERM EXAMINATION 2009
(Session - 1)

Calculus & Analytical Geometry-I

Question No: 1 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative ..... At x_0

- ► Minima
- ► Maxima
- ► None of these

Question No: 2 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative ..... At x_0

- ► Minima
- ► Maxima
- ► None of these

Question No: 3 (Marks: 1) - Please choose one

$\lim_{x \to 0} \frac{\sin 2x}{x} = -----$

- ► 2
- ► 4
- ► 1
- ► ∞

Question No: 4 (Marks: 1) - Please choose one

$\lim_{x \to 0^+} \frac{\ln x}{1/x} = -----$

- ► 1
- ► 0
- ► e
- ► None of these

Question No: 5 (Marks: 1) - Please choose one

$\frac{d(\tan x)}{dx} =$

- ► $\sec x$
- ► $\sec^2 x$
- ► $co\sec x$
- ► $co\sec^2 x$

Question No: 6 (Marks: 1) - Please choose one

If $xy = 4$ then $\frac{dy}{dx} =$

- ► 0
- ► $\frac{-1}{x^2}$
- ► $\frac{4}{x^2}$
- ► $\frac{-4}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}\left((c)\{h(x)\}\right) =$ _____

- ► 0
- ► $\frac{d}{dx}\left(h(x)\right)$
- ► $\frac{d}{dx}\left(h(cx)\right)$
- ► $c\frac{d}{dx}\left(h(x)\right)$

Question No: 8 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$\frac{d}{dx}[f][g] =$

- ► $\frac{[f'][g]-[f][g']}{g^2}$
- ► $[f'][g']$
- ► $[f'][g]+[f][g']$
- ► $[f'][g]-[f][g']$

Question No: 9 (Marks: 1) - Please choose one

The power rule, $\frac{d}{dx}[x^n] = nx^{n-1}$ holds if n is _____

- ► An integer
- ► A rational number
- ► An irrational number
- ► All of the above

Question No: 10 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denotes two distinct points in that interval. If $f(x_1) = f(x_2)$ for all points x_1 and x_2 then which of the following statement is correct?

- ► f is a decreasing function
- ► f is an increasing function
- ► f is a constant function

Question No: 11 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then which of the following statement is correct?

- ► f is concave up on (a, b).
- ► f is concave down on (a, b)
- ► f is linear on (a, b).

Question No: 12 (Marks: 1) - Please choose one

$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$

What does 'n' represent in Riemann Sum ?

- ► No. of Circles
- ► No. of Rectangles
- ► No. of Loops
- ► No. of Squares

Question No: 13 (Marks: 1) - Please choose one

If f is continuous function such that $\lim_{x\to-\infty} f(x) = +\infty$ *and* $\lim_{x\to+\infty} f(x) = +\infty$ then f has _____ on $(-\infty, +\infty)$

- ► maximum value but no minimum
- ► minimum value but no maximum
- ► both maximum and minimum value

Question No: 14 (Marks: 1) - Please choose one

$\int_2^t \frac{x^2}{2}dx$

The expression , represents a function of :

- ► t
- ► x
- ► 2
- ► Both t and x

Question No: 15 (Marks: 1) - Please choose one

$\int cf(x)dx = \_\_\_\_\_$

if c is a constant

- 0
- c
- $\int f(cx)dx$
- $c\int f(x)dx$

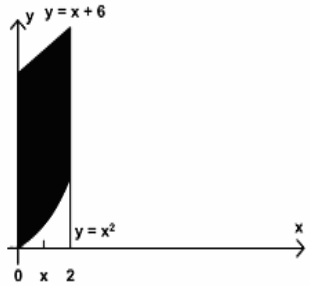
Question No: 16 (Marks: 1) - Please choose one

Sigma notation is represented by which of the following Greek letter?

- χ
- η
- Σ
- ψ

Question No: 17 (Marks: 1) - Please choose one

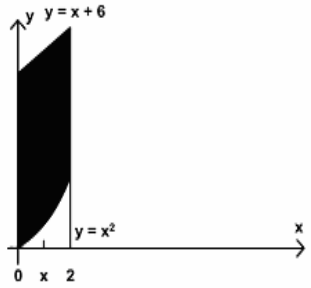
In the following figure, the area enclosed is bounded below by **:**



- $y = x + 6$
- $y = x^2$
- $x = 2$
- $x = 0$

Question No: 18 (Marks: 1) - Please choose one

In the following figure, the area bounded on the sides by the lines are **:**



- $x = 0$
- $x = 2$
- $x = 0 \text{ and } x = 2$
- $x = 6$

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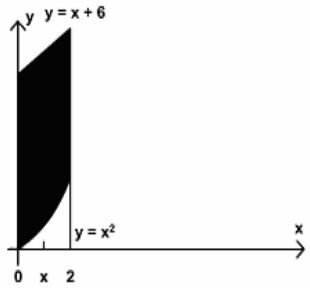
What is the area of the region in the following figure?



- $A = \int_0^2 \left[(x+6) - (x^2) \right] dx$
- $A = \int_x^2 \left[(x+6) - (x^2) \right] dx$

$$A=\int_0^2\left[(x+6)+(x^2)\right]dx$$

▶

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▶

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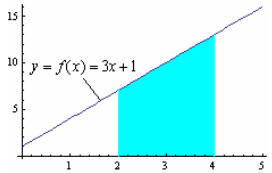

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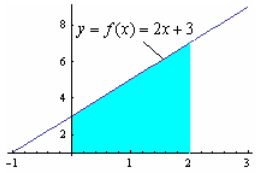

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▶ 8
▶ 10
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▶ $c\int_a^b f(x)dx+c\int_a^b g(x)dx$

▶ 0

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$\lim_{x\to\infty}\sum_{k=1}^{n}[x_k][f(x_k)]$ *where n is number of subdivisions of* $[a,b]$

▶

▶ $\int_a^b f(x)\,dx$

▶ $\pi[radius]^2$

▶ (Width) (Height)

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►

$L = \int_a^b \sqrt{1 + [f'(x)]^2}dx$

►

$L = \int_0^a \sqrt{1 + [f'(x)]}dy$

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Let $t = x^3+2x^2+x-3$

Is the following substitution correct?

$$\int \frac{3x^2+4x+1}{x^3+2x^2+x-3}\,dx = \int \frac{1}{t}\,dt$$

- ► Yes
- ► No

Question No: 31 (Marks: 1) - Please choose one

$$\rho = \lim_{k\to\infty} \frac{u_{k+1}}{u_k}$$

The series $\sum u_k$ be a series with positive terms and suppose that if $\rho = 1$, then which of the following is true?

- ► Converges
- ► Diverges
- ► May converges or diverges
- ► Gives no information

Question No: 32 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that

$\rho = \lim_{k\to\infty} \sqrt[k]{u_k} = \lim_{k\to\infty} (u_k)^{\frac{1}{k}}$ if $\rho = 1$, then which of the following is true?

- ► Converges
- ► Diverges
- ► May converges or diverges
- ► Gives no information

Question No: 33 (Marks: 1) - Please choose one

$$\sum_{k=1}^{\infty} |u_k| = |u_1| + |u_2| + |u_3| + \ldots |u_k| + \ldots$$

If the series converges , then which of

$$\sum_{k=1}^{\infty} u_k = u_1 + u_2 + u_2 + \ldots u_k + \ldots$$

the following is true for ?

- ► Converges
- ► Diverges
- ► Gives no information

Question No: 34 (Marks: 1) - Please choose one

$$\rho = \lim_{k\to\infty} \frac{|u_{k+1}|}{|u_k|}$$

Let $\sum u_k$ be a series with nonzero terms and suppose that if $\rho = +\infty$, then which of the following is true?

- ► Then the series $\sum u_k$ diverges
- ► The series $\sum u_k$ converges absolutely and therefore converges
- ► May converges or diverges
- ► Gives no information

Question No: 35 (Marks: 1) - Please choose one

$$\int_{-1}^{1} (x-1)\,dx = \_\_\_\_\_$$

- ► -2
- ► 0
- ► 2
- ► 4

Question No: 36 (Marks: 1) - Please choose one

How many critical points exist for a function f if

$f'(x) = (x-3)(x-2)$

- Zero
- One
- Two
- Four

Question No: 37 (Marks: 1) - Please choose one

$\log_b ac =$ _____

- $\log_b a + \log_b c$
- $\log_b a - \log_b c$
- $\frac{\log_b a}{\log_b c}$
- $(\log_b a)(\log_b c)$

Question No: 38 (Marks: 1) - Please choose one

$\log_b a^r =$ _____

- $a \log_b r$
- $r \log_b a$
- $\frac{\log_b a}{\log_b r}$
- $\log_b a + \log_b r$

Question No: 39 (Marks: 1) - Please choose one

$y = \frac{2\sqrt{2}}{3} x^{\frac{3}{2}}$; $0 \le x \le 2$

Let then which of the following is the length of the curve?

- $L = \int_0^2 \sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$
- $L = \int_0^2 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3} x^{\frac{3}{2}}\right)\right]^2}\, dx$

Question No: 40 (Marks: 1) - Please choose one

Which of the following are *first two* terms for the Taylor series of $f(x) = e^{-x}$ at $x = 0$?

- $1 + (1)(x-0)$
- $1 + (-1)(x+0)$
- $1 + (-1)(x-0)$
- $(-1)(x-0)$

Question No: 41 (Marks: 2)

$$\int_2^3 (1-x)dx$$

Evaluate the integral

$$\int_2^3 (1-x)dx$$
$$= |\, x - x^2 \frac{1}{2} |_2^3$$
$$= \frac{1}{2} |\, 2x - x^2 \,|_2^3$$
$$= \frac{1}{2}(2(3-2)-(3-2)^2)$$
$$= \frac{1}{2}(2-1)$$
$$= \frac{1}{2}$$

Question No: 42 (Marks: 2)

$$\int_2^{+\infty} \frac{dx}{x^2}$$

Evaluate the improper integral

Question No: 43 (Marks: 2)

A function $f(x) = x^2 - 4x - 9$ has critical point 2 in an interval [0, 5]. Find the maximum value of the function and point having this value.

Question No: 44 (Marks: 3)

$$\int \frac{5 - 6\sin^2 x}{\sin^2 x} dx$$

Evaluate:

$$\int \frac{5 - 6\sin^2 x}{\sin^2 x} dx$$

Question No: 45 (Marks: 3)

Find the area of the region bounded by the curve $y = x^2 \;,\; x > 0$, and bounded on the sides by the lines $y = 1$ and $y = 4$

$y = x^2 \;,\; x > 0$

So we have

$$A = \int_1^4 x^2 dx$$
$$= |\, \frac{x^3}{3} |_1^4$$
$$= \frac{1}{3}(4-1)^3$$
$$= \frac{1}{3}(3)^3$$
$$= 9$$

Question No: 46 (Marks: 3)

Determine whether the following sequence converges or diverges. If it converges, find the limit.

$$\lim_{n \to \infty} \frac{5n^2 - 1}{20n + 7n^2}$$

Question No: 47 (Marks: 5)

Use the Alternating series Test to determine whether the given series converges

$$\sum_1^{\infty} \frac{(-1)^{n-1} \cdot n!}{2^n}$$

Question No: 48 (Marks: 5)

Evaluate the integral

$$\int_{\frac{\pi}{2}}^{0} \frac{1 + \cos 2t}{2} dt$$

Solution

$$\int_{\frac{\pi}{2}}^{0} \frac{1+\cos 2t}{2} dt$$

$u = 2t$

$\frac{du}{dt} = 2dt$

$du = 2dt$

so

$$= \frac{1}{4}\int_{\frac{\pi}{2}}^{0} 1+\cos u du$$

$$= \frac{1}{4} | u + \sin u |_{\frac{\pi}{2}}^{0}$$

$$= \frac{1}{4} | 2t + \sin 2t |_{\frac{\pi}{2}}^{0}$$

$$= \frac{1}{4}(2\frac{\pi}{2} + \sin 2\frac{\pi}{2})$$

$$= \frac{1}{4}(\pi + \sin \pi)$$

$$= \frac{1}{4}(\pi + 0)$$

$$= \frac{\pi}{4}$$

Question No: 49 (Marks: 5)

Evaluate the sums

$$\sum_{k=1}^{5} k(3k+5)$$

$$= 1(3+5) + 2(6+5) + 3(9+5) + 4(12+5) + 5(15+5)$$

$$= 8 + 22 + 3(45) + 4(60) + 5(75)$$

$$= 8 + 22 + 135 + 240 + 375$$

$$= 780$$

Question No: 50 (Marks: 10)

Find the volume of the solid that results when the region enclosed by the given curves is revolved about the x – axis**.**

$y = 1 + x^3$, $x = 1, x = 2, y = 0$

from $V = \int_{a}^{b} \pi[f(x)]^2 dx$

$$V = \int_{1}^{2} \pi[1 + x^3]^2 dx$$

$$V = \int_{1}^{2} \pi[1 + x^5 + 2x^3] dx$$

$$V = \pi \int_{1}^{2} (1 + x^5 + 2x^3) dx$$

$$V = \pi | (x + \frac{1}{6}x^6 + \frac{1}{2}x^4) |_1^2$$

$$V = \pi((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4)$$

$$V = \pi\{((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4)\}$$

$$V = \pi((1) + \frac{1}{6} + \frac{1}{2}))$$

$$V = \frac{\pi(6+1+3)}{6}$$

$$V = \frac{\pi(10)}{6} = \pi\frac{5}{3}$$

This paper is solved by our best knowledge. In the case of any error/correction/suggestion, please contact at gulshanvu@yahoo.com, with reference to the concerned paper's number.

FINALTERM EXAMINATION 2009

Calculus & Analytical Geometry-I

Time: 120 min
Marks: 80

Question No: 1 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative ……. At x_0

► Minima
► Maxima
► None of these

Question No: 2 (Marks: 1) - Please choose one

In the notation
$\int f(x)dx = F(x) + C$
C represents

► A polynomial
► A Constant
► A Variable
► None of these

Question No: 3 (Marks: 1) - Please choose one

According to Power-Rule of differentiation, if $f(x) = x^n$ where n is a real number, then $\frac{d}{dx}[x^n] =$

► x^{n-1}
► $n x^{n-1}$
► $n x^{n+1}$
► $(n-1)x^{n+1}$

Question No: 4 (Marks: 1) - Please choose one

If $2x - y = -3$ then $\frac{dy}{dx} =$

► 2
► -2
► 0
► -3

Question No: 5 (Marks: 1) - Please choose one

30^0 = _____

► $\frac{\pi}{3}$
► $\frac{\pi}{4}$
► $\frac{\pi}{6}$
► $\frac{\pi}{2}$

Question No: 6 (Marks: 1) - Please choose one

If a function g is differentiable at a point x and a function f is differentiable at a point g(x), then the _____ is differentiable at point x .

► Composition (f o g)
► Quotient (f / g)
► Product (f . g)
► Sum (f + g)

Question No: 7 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denote points in that

interval. If $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ then which of the following statement is correct?

- ► f is an increasing function.
- ► f is a decreasing function.
- ► f is a constant function.

Question No: 8 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then which of the following statement is correct?

- ► f is concave up on (a, b).
- ► f is concave down on (a, b)
- ► f is linear on (a, b).

Question No: 9 (Marks: 1) - Please choose one

The sum $\sum_{k=1}^{n} f(x^*_k)\Delta x_k$ is known as:

- ► Riemann Sum
- ► General Sum
- ► Integral Sum
- ► Geometric Sum

Question No: 10 (Marks: 1) - Please choose one

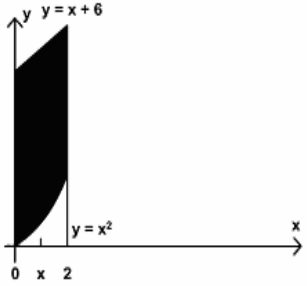
$$\sum_{k=1}^{n} f(x^*_k)\Delta x_k$$

What does 'n' represent in Riemann Sum ?

- ► No. of Circles
- ► No. of Rectangles
- ► No. of Loops
- ► No. of Squares

Question No: 11 (Marks: 1) - Please choose one

What is the area of the region in the following figure?



- ► $A = \int_0^2 \left[(x+6) - (x^2)\right] dx$
- ► $A = \int_x^2 \left[(x+6) - (x^2)\right] dx$
- ► $A = \int_0^2 \left[(x+6) + (x^2)\right] dx$
- ► $A = \int_0^x \left[(x+6) - (x^2)\right] dx$
- ►

Question No: 12 (Marks: 1) - Please choose one

If $\int_1^4 f(x)\,dx = 2$ and $\int_1^4 g(x)\,dx = 10$ then which of the following is value of $\int_1^4 [3f(x) - g(x)]\,dx$?

- ► 16
- ► 12
- ► -4
- ► -8

Question No: 13 (Marks: 1) - Please choose one

$\int_0^1 2x(x^2+4)dx =$ _____

▶ $\frac{9}{2}$

▶ $\frac{5}{2}$

▶ $\frac{2}{5}$

▶ $\frac{-9}{2}$

▶

Question No: 14 (Marks: 1) - Please choose one

Let f is a smooth function on [0, 3]. What will be the arc length L of the curve y = f(x) from
x = 0 to x = 3?

▶ $L=\int_0^3 \sqrt{1+[f(x)]^2}\,dy$

▶ $L=\int_a^b \sqrt{1+[f'(x)]^2}$

▶ $L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dy$

▶ $L=\int_0^3 \sqrt{1+[f'(x)]^2}\,dx$

▶

Question No: 15 (Marks: 1) - Please choose one

Let f be a smooth, nonnegative function on [1, 3]. What is the surface area S generated by revolving the portion of the curve y = f(x) between x = 1 and x = 3 about the x-axis?

▶ $S=\int_0^2 2\sqrt{1+[f(x)]}\,dx$

▶ $S=\int_0^3 2\pi f(x)\sqrt{1+[f'(x)]}\,dx$

▶ $S=\int_0^2 2\sqrt{1+[f'(x)]}\,dx$

▶ $S=\int_1^3 2\pi f(x)\sqrt{1+[f'(x)]^2}\,dx$

▶

Question No: 16 (Marks: 1) - Please choose one

Let an object is displaced 2m by a force of 2N. What is the work done W?

▶ - 4
▶ 4
▶ 2
▶ 0

Question No: 17 (Marks: 1) - Please choose one

$$\int_a^{+\infty} f(x)dx=\lim_{l\to\infty}\int_\alpha^l f(x)dx$$

Consider the improper integral if the limit exists then which of the following can be occured?

▶ Diverges
▶ Converges
▶ Test fail

Question No: 18 (Marks: 1) - Please choose one

If f is continuous on (a, b] but does not have a limit from the right then the integral

$$\int_a^b f(x)dx=\lim_{l\to a}\int_l^b f(x)dx$$

defined by is called **:**

▶ Improper

► Proper
► Line

Question No: 19 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the difference between successive terms $a_{n+1} - a_n < 0$ then the sequence is known as **:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 20 (Marks: 1) - Please choose one

For a sequence $\{a_n\}$ if the ratio of successive terms $\frac{a_{n+1}}{a_n} > 1$ then the sequence is known as**:**

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 21 (Marks: 1) - Please choose one

Which of the following is true for the sequence $\{n\}_{n=0}^{\infty}$?

► Nonincreasing
► Nondecreasing
► Increasing
► Decreasing

Question No: 22 (Marks: 1) - Please choose one

If $f(n) = a_n$ is the nth term of the sequence and f is differentiable and $f'(n) \le 0$ then the sequence will be :

► Increasing
► Decreasing
► Nondecreasing
► Nonincreasing

Question No: 23 (Marks: 1) - Please choose one

If Newton's Method is used to approximate the real solutions of the equation $x^3 + x - 3 = 0$ and the first guess $x_1 = 1$, What is x_2 ?

► $\frac{5}{4}$
► $\frac{1}{4}$
► $\frac{-1}{2}$
► $\frac{3}{4}$
► $\frac{3}{2}$

Question No: 24 (Marks: 1) - Please choose one

Suppose that we apply Newton's Method to approximate the real solutions of the equation $x^3 - 2x^2 - 1 = 0$. If we start at $x_1 = 2$, then which of the following is value of x_2 ?

► 6
► 2.25
► 0
► 2

Question No: 25 (Marks: 1) - Please choose one

If the sequence of partial sum of a series converges then what will the series show itself ?

► Diverges
► Converges
► Gives no information

Question No: 26 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that $\rho = \lim_{k\to\infty} \frac{u_{k+1}}{u_k}$ if $\rho > 1$, then which of the following is true?

► Converges
► Diverges
► May converges or diverges
► Gives no information

Question No: 27 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that $\rho = \lim_{k\to\infty} \frac{u_{k+1}}{u_k}$ if $\rho = 1$, then which of the following is true?

► Converges
► Diverges
► May converges or diverges
► Gives no information

Question No: 28 (Marks: 1) - Please choose one

The series $\sum u_k$ be a series with positive terms and suppose that $\rho = \lim_{k\to\infty} \sqrt[k]{u_k} = \lim_{k\to\infty} (u_k)^{\frac{1}{k}}$ if $\rho = 1$, then which of the following is true?

► Converges
► Diverges
► May converges or diverges
► Gives no information

Question No: 29 (Marks: 1) - Please choose one

For an alternating series to be convergent which of the following condition must be satisfied?

► $\lim_{k\to\infty} a_k = 1$
► $a_1 > a_2 > a_3 ..... > a_k > ....$
► $a_1 \le a_2 \le a_3 ..... \le a_k \le ....$
► Gives no information

Question No: 30 (Marks: 1) - Please choose one

For an alternating series to be convergent which of the following condition must be satisfied?

► $a_1 \ge a_2 \ge a_3 ..... \ge a_k \ge ....$
► $\lim_{k\to\infty} a_k = 0$
► $a_1 \le a_2 \le a_3 ..... \le a_k \le ....$
► $\lim_{k\to\infty} a_k = 1$

Question No: 31 (Marks: 1) - Please choose one

What is the base of natural logarithm?

► 2.71
► 10
► 5
► Any real number

Question No: 32 (Marks: 1) - Please choose one

A function F is called an antiderivative of a function f on a given interval if _____ $= f(x)$, for all x in that interval.

► $F'(x)$
► $F(x)$
► $f'(x)$
► $f''(x)$

Question No: 33 (Marks: 1) - Please choose one

$\log_b ac =$ _____

▶ $\log_b a + \log_b c$

▶ $\log_b a - \log_b c$

▶ $\frac{\log_b a}{\log_b c}$

▶ $(\log_b a)(\log_b c)$

Question No: 34 (Marks: 1) - Please choose one

$\log_b a^r =$ _____

▶ $a \log_b r$

▶ $r \log_b a$

▶ $\frac{\log_b a}{\log_b r}$

▶ $\log_b a + \log_b r$

Question No: 35 (Marks: 1) - Please choose one

$\log_b \frac{1}{c} =$ _____

▶ $\log_b c$

▶ $1 - \log_b c$

▶ $-\log_b c$

▶ $1 + \log_b c$

Question No: 36 (Marks: 1) - Please choose one

$\log_b \frac{1}{t} =$ _____

▶ $\log_b t$

▶ $1 - \log_b t$

▶ $1 + \log_b t$

▶ $-\log_b t$

Question No: 37 (Marks: 1) - Please choose one

What is the sum of following series?

$1^2 + 2^2 + 3^2 + 4^2 + \_\_\_\_\_ + n^2$

▶ $\frac{n(n+1)(2n+1)}{6}$

▶ $\frac{n(2n)(2n+1)}{6}$

▶ $\frac{(n+1)(n+2)}{2}$

▶ $\frac{(n+1)(2n+1)}{6}$

Question No: 38 (Marks: 1) - Please choose one

$\sum_{k=1}^{n} \frac{k^3}{2} =$ _____

$\frac{n(n+1)}{4}$

▶

$\frac{[n(n+1)]^2}{8}$

▶

$\frac{n(n+1)(2n+1)}{12}$

▶

Question No: 39 (Marks: 1) - Please choose one

$y = \frac{2\sqrt{2}}{3}x^{\frac{3}{2}} - 2x \;;\; 0 \le x \le 1$

Let then which of the following is the length of the curve?

$L = \int_0^1 \sqrt{1 + \left[\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}} - 2x\right)\right]^2}\, dx$

▶

$L = \int_0^1 \sqrt{\left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}} - 2x\right)\right]^2}\, dx$

▶

$L = \int \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}} - 2x\right)\right]^2}\, dx$

▶

$L = \int_0^1 \sqrt{1 + \left[\frac{d}{dx}\left(\frac{2\sqrt{2}}{3}x^{\frac{3}{2}} - 2x\right)\right]^2}\, dx$

▶

Question No: 40 (Marks: 1) - Please choose one

If $f(x) = e^{-x}$ at $x = 0$ be the Taylor series, then which of the following is also true?

▶ Arithmetic series

▶ Maclaurin series

▶ Geometric series

▶ Harmonic series

Question No: 41 (Marks: 2)

$u = \frac{\pi}{2} - x$ $\int_0^{\pi} \sin(\frac{\pi}{2} - x)dx$

Using substitution transform the integral into variable u.

Question No: 42 (Marks: 2)

$\int_3^{+\infty} \frac{dx}{2x^2}$

Evaluate the improper integral

Question No: 43 (Marks: 2)

A function $f(x) = 6 - 2x - x^2$ has critical point 1 in an interval [-4, 3]. Find the absolute minimum value of the function.

Question No: 44 (Marks: 3)

Find the absolute maximum value of the function:

$f(x) = 2x^3 + 3x^2 - 12x + 4$ *on* $[-4, 2]$

Question No: 45 (Marks: 3)

Find the area of the region bounded by the curve $y = x^2 - 4x - 5$ and $y = x + 1$ (do not evaluate).

Question No: 46 (Marks: 3)

$\left\{\frac{3}{n^2}\right\}_{n=5}^{\infty}$

Determine whether the following sequence is strictly monotone:

Question No: 47 (Marks: 5)

Determine whether the sequence converges or diverges. If converges find limit

$\lim_{n\to\infty} \frac{3^n + (-1)^n}{3^{n+1} + (-1)^{n+1}}$

Question No: 48 (Marks: 5)

Find the lengths of the curves

$x = \frac{t^2}{2}, \quad y = \frac{(2t+1)^{\frac{3}{2}}}{3}, \quad 0 \le t \le 4$

Question No: 49 (Marks: 5)

Evaluate the indefinite integral $\int \left[(x^4+2)\right]\left[\cos(x^5+10x)\right] dx$ by substitution method.

Question No: 50 (Marks: 10)

Find the Maclaurin series for $f(x) = e^{2x}$