

- ▶ $x = 0$
- ▶ $x = 2$
- ▶ $x = 0$ and $x = 2$
- ▶ $x = 6$

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

What is the sum of following series?
 $1 + 2 + 3 + 4 + \dots + n$

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

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 $x = 3$?

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

▶

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

$$y = \frac{x^2}{2}$$

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

$$\frac{dy}{dx} =$$

If $2x - y = -3$ then

$$2$$

$$-2$$

$$0$$

$$-3$$

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

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

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

▶

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

▶

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

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

- (-∞, ∞)
- (0, ∞)
- (-∞, ∞)
- (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

$$\text{Let } t = x^3 + 2x^2 + x - 3$$

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 continuous 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

$$\int_1^{2/3} dx = \underline{\hspace{2cm}}$$

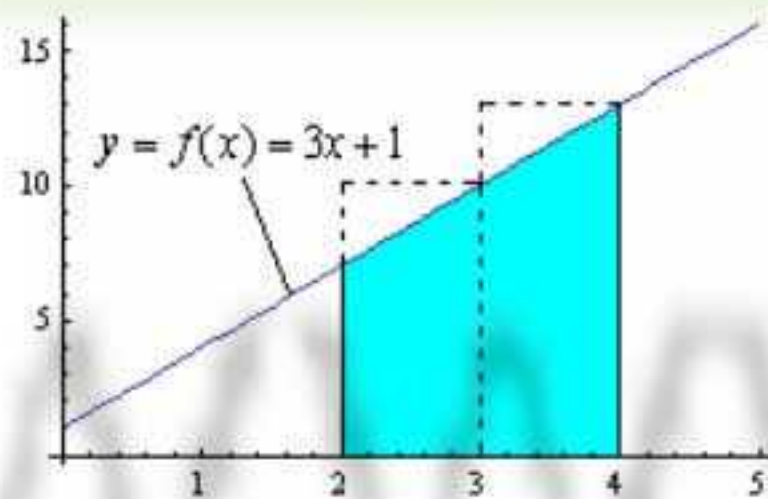
- ▶ $-\frac{1}{3}$
- ▶ 0
- ▶ $\frac{1}{3}$
- ▶ $\frac{2}{3}$
- ▶ $\frac{1}{3}$

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

$$\int_0^2 x dx = \underline{\hspace{2cm}}$$

- ▶ 2
- ▶ 0
- ▶ 2
- ▶ -2
- ▶ $\frac{x^2}{2}$
- ▶ 2

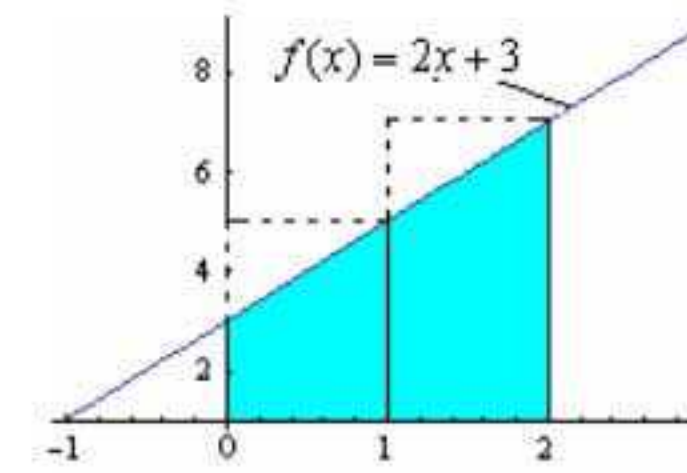
Question No: 25 (Marks: 1) - Please choose one



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?

- ▶ $\frac{1}{n}$
- ▶ $\frac{2}{n}$
- ▶ $\frac{3}{n}$
- ▶ $\frac{4}{n}$
- ▶ $\frac{1}{n}$

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

Evaluate

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2} = \underline{\hspace{2cm}}$$

- ▶ 4
- ▶ 2
- ▶ 1
- ▶ ∞

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

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

represents the sequence:

$$\frac{-1}{2}, \frac{-1}{4}, \frac{-1}{8}, \dots$$

▶

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$$

$$0, 1, \frac{1}{2}, \frac{1}{4}, \dots$$

$$0, 1, 2, 3, \dots$$

Question No: 30 (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**

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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $\rho = \lim_{k \rightarrow \infty} \sqrt[k]{u_k}$ 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

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

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

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

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

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

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

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

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

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

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

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

▶ 0

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

What is the difference between the values of the

$$\int_a^b f(x)dx \text{ and } \int_a^b f(t)dt$$

integrals ?

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

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

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

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)

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

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:

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

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

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

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

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:

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

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

Question No: 49 (Marks: 5)

Use L'Hopital's rule to evaluate the limit

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

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

$$= 0/0$$

So by L'Hopital's rule

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

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

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

Question No: 50 (Marks: 10)

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

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

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

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

$$y = \frac{x^2}{2}$$

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 $\frac{dy}{dx} =$

$$2$$

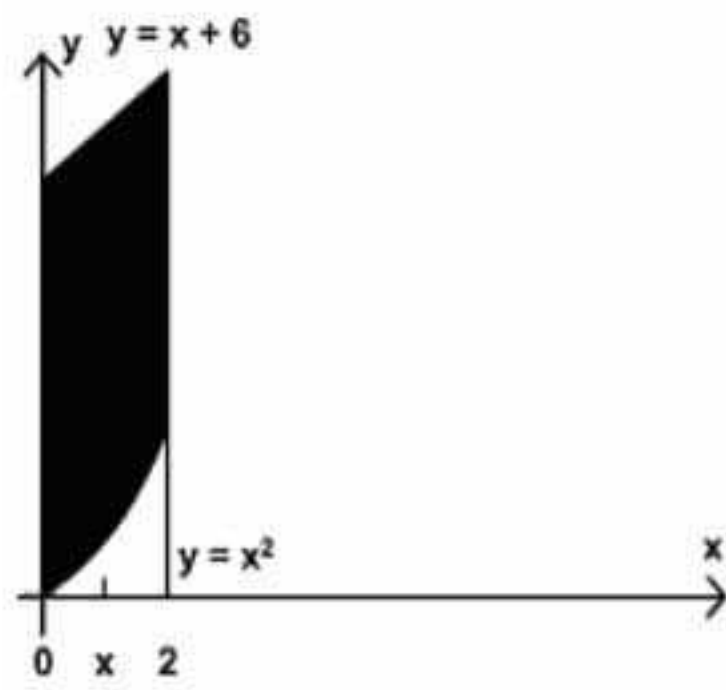
$$-2$$

$$0$$

$$-3$$

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

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



- ▶ $x=0$
- ▶ $x=2$
- ▶ $x=0$ and $x=2$
- ▶ $x=6$

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

What is the sum of following series?
 $1+2+3+4+\dots+n$

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

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**
- ▶ Isoceles triangle
- ▶ Equilateral triangle

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

Which operation can not be applied on the functions?

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- ▶ **Cross product**
- ▶ Addition
- ▶ Composition

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

- ▶ **Parabola**
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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 integer

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

$\log_b ac =$ _____

▶ **$\log_b a + \log_b c$**

▶ $\log_b a - \log_b c$

▶ $\frac{\log_b a}{\log_b c}$

▶ $(\log_b a)(\log_b c)$

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▶ $f(c) = \frac{f(b) - f(a)}{b - a}$

▶ $f(c) = \frac{f(a) - f(b)}{b - a}$

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

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

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

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

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

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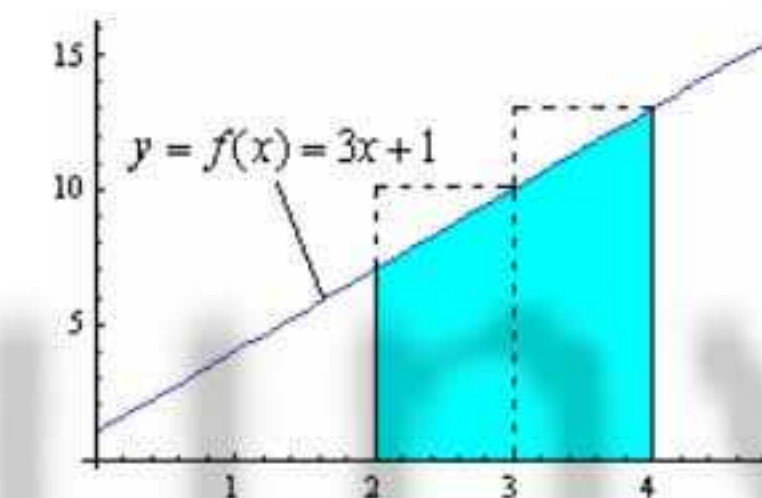
- ▶ $-\frac{1}{3}$
- ▶ 0
- ▶ $\frac{1}{3}$
- ▶ **$\frac{2}{3}$**

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

$$\int_0^2 x \, dx = \underline{\hspace{2cm}}$$

- ▶ **2**
- ▶ 0
- ▶ 2
- ▶ -2
- ▶ $\frac{x^2}{2}$
- ▶ 2

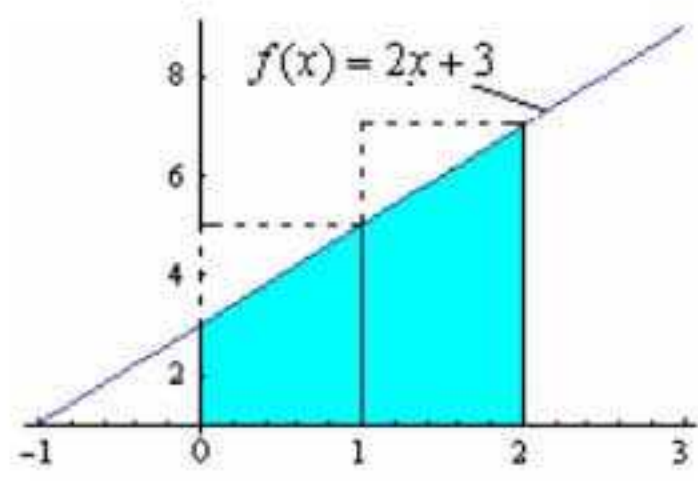
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- ▶ 23
- ▶ 26

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- ▶ 10

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- ▶ 14

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

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- ▶ $\frac{2}{n}$
- ▶ $\frac{3}{n}$
- ▶ $\frac{4}{n}$

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

Evaluate

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

- ▶ 4
- ▶ 2
- ▶ 1
- ▶ ∞

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

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

represents the sequence:

- ▶ $\frac{-1}{2}, \frac{-1}{4}, \frac{-1}{8}, \dots$

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$$

- ▶ $0, 1, \frac{1}{2}, \frac{1}{4}, \dots$
- ▶ $0, 1, 2, 3, \dots$

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

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- ▶ Diverges
- ▶ Gives no information

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

If $\rho = \lim_{k \rightarrow \infty} \sqrt[k]{u_k}$ 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

$$\int_a^d f(x) dx = \underline{\hspace{2cm}}$$

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

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

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

▶ $\int_a^d f(x) dx$

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

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

$$\int_a^b c [f(x) + g(x)] dx = \underline{\hspace{2cm}}$$

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

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

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

▶ 0

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

What is the difference between the values of the

$$\int_a^b f(x) dx \text{ and } \int_a^b f(t) dt$$

integrals ?

- ▶ Differ by $b-a$
- ▶ Differ by $a-b$
- ▶ **No difference**
- ▶ Differ by $b+a$

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

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

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)

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

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:

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

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

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

$$= x\sqrt{x} + \int 1/\sqrt{x} \cdot 1 dx$$

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:

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

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

Question No: 49 (Marks: 5)

Use L'Hopital's rule to evaluate the limit

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

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

$$= 0/0$$

So by L'Hopital's rule

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

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

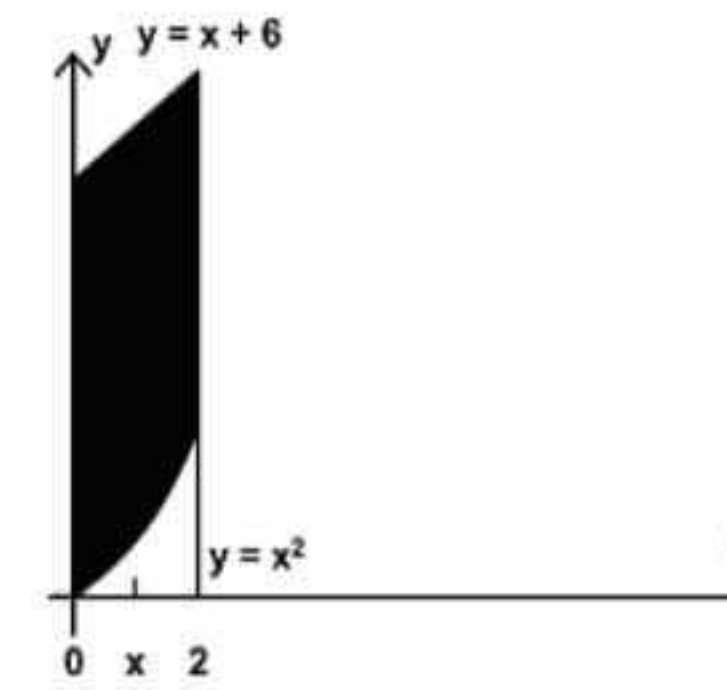
$$= \lim_{x \rightarrow \frac{\pi}{2}} \frac{-\cos x}{-2 \sin 2x} = \frac{\cos \frac{\pi}{2}}{2 \sin \pi} = 0$$

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.

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



- ▶ $x = 0$
- ▶ $x = 2$
- ▶ $x = 0$ and $x = 2$
- ▶ $x = 6$

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

What is the sum of following series?
 $1 + 2 + 3 + 4 + \dots + n$

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

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 $x = 3$?

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

▶

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 :

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

▶

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

▶

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

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 continuous functions on an interval $[a, b]$ and $f(x) \geq g(x)$ for $a \leq x \leq b$, then the 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

$$\int_1^{2/3} dx = \underline{\hspace{2cm}}$$

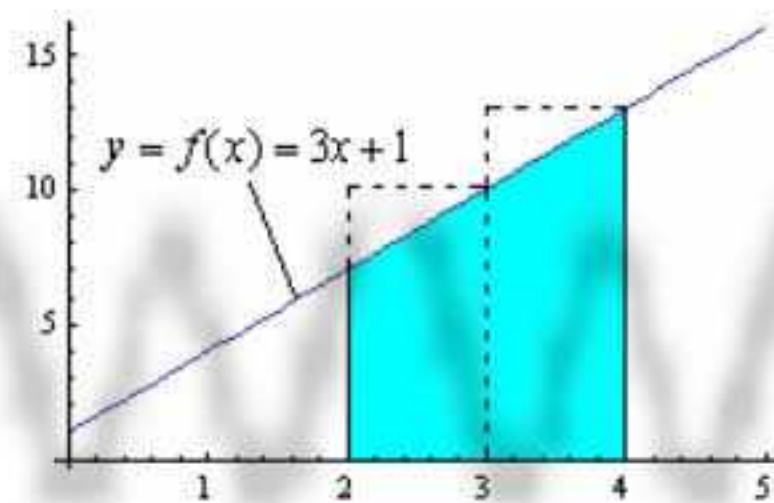
- ▶ $-\frac{1}{3}$
- ▶ 0
- ▶ $\frac{1}{3}$
- ▶ $\frac{2}{3}$
- ▶ $\frac{1}{3}$

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

$$\int_0^2 x \, dx = \underline{\hspace{2cm}}$$

- ▶ 2
- ▶ 0
- ▶ 2
- ▶ -2
- ▶ $\frac{x^2}{2}$
- ▶ 2

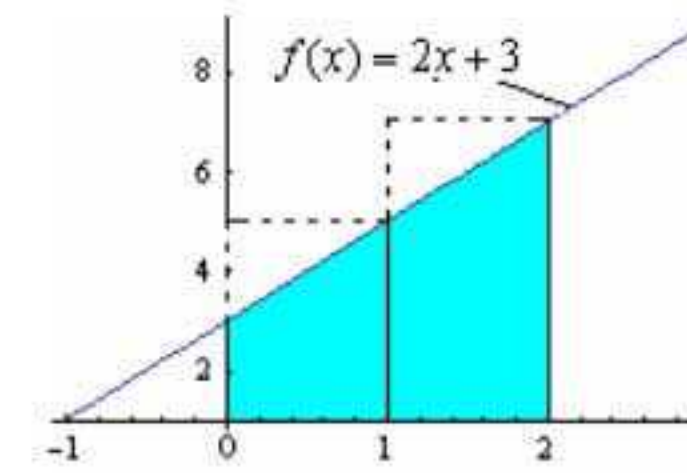
Question No: 25 (Marks: 1) - Please choose one



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?

- ▶ $\frac{1}{n}$
- ▶ $\frac{2}{n}$
- ▶ $\frac{3}{n}$
- ▶ $\frac{4}{n}$
- ▶ $\frac{1}{n}$

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

Evaluate

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2} = \underline{\hspace{2cm}}$$

- ▶ 4
- ▶ 2
- ▶ 1
- ▶ ∞

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

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

represents the sequence:

$$\frac{-1}{2}, \frac{-1}{4}, \frac{-1}{8}, \dots$$

▶

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$$

$$0, 1, \frac{1}{2}, \frac{1}{4}, \dots$$

$$0, 1, 2, 3, \dots$$

Question No: 30 (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**

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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $\rho = \lim_{k \rightarrow \infty} \sqrt[k]{u_k}$ 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

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

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

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

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

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

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

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

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

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

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

▶ 0

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

What is the difference between the values of the

$$\int_a^b f(x)dx \text{ and } \int_a^b f(t)dt$$

integrals ?

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

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

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

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)

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

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

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Evaluate the following integral:

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

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

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

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

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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.

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Compute the following sum:

$$\sum_{i=1}^n (4i^2 - i) = (4(1)^2 - 1) + (4(2)^2 - 2) + (4(3)^2 - 3) + (4(4)^2 - 4) \dots = 3 + 14 + 33 + 60 \dots$$

Question No: 49 (Marks: 5)

Use L'Hopital's rule to evaluate the limit

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

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

$$= 0/0$$

So by L'Hopital's rule

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

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

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

Question No: 50 (Marks: 10)

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

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

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

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

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

- Exist
- Does not exist

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

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

- $(\sec x)(\tan x)$
- $(\sec x)(\tan x)$
- $(\operatorname{cosec} x)(\cot x)$
- $(\operatorname{cosec} x)(\tan x)$

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

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

$$\frac{d}{dx}(c \{h(x)\}) = \underline{\hspace{2cm}}$$

- ▶ 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

$$\lim_{x \rightarrow -\infty} f(x) = +\infty \text{ and } \lim_{x \rightarrow +\infty} f(x) = +\infty$$

If f is continuous function such that f has _____ on $(-\infty, +\infty)$

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

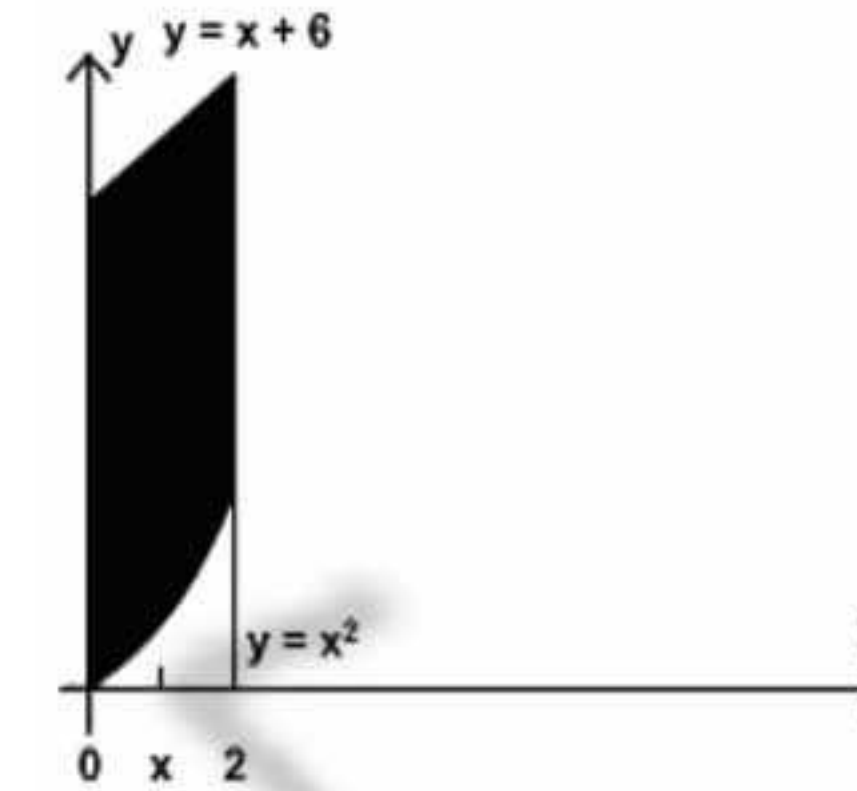
Question No: 5 (Marks: 1) - Please choose one

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

$$y = \sqrt{x} \quad ; \quad x = 1, x = 4$$

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 $[a, b]$?

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

▶

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

▶

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

▶

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

▶

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

$$\frac{(x^2 - 4)}{(x - 2)}$$

Domain of the function $y =$ is

▶ $(-\infty, 2) \cup (2, +\infty)$

▶ $(-\infty, 2)$

▶ $(-\infty, 0)$

▶

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

$\tan(x)$ is continuous every where except at points

▶ $\pm \frac{k\pi}{2} (k = 1, 3, 5, \dots)$

▶ $\pm \frac{k\pi}{2} (k = 2, 4, 6, \dots)$

▶

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



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

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = \text{-----}$$

- ▶ -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?

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



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



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



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



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

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

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: 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

$$f'(x_n) = 0 \text{ for some } n$$

For a function f , let

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

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

$\frac{n(2n)(2n+1)}{6}$

▶

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

▶

$\left[\frac{n(n+2)}{2}\right]^2$

▶

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

▶

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

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

$\frac{5n(n+1)(2n+1)}{42}$

▶

- ▶ $\frac{5n(n+1)}{14}$
- ▶ $\frac{5n^2(n+1)^2}{14}$
- ▶ $\frac{5(n+1)(2n+1)}{42}$
- ▶

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

$$\int_a^a f(x)dx = \underline{\hspace{2cm}}$$

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 $a_1 > a_2 > a_3 > \dots > a_n > \dots$, 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:

- ▶ Increasing
- ▶ Decreasing
- ▶ Nondecreasing
- ▶ Nonincreasing

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

$$\frac{a_{n+1}}{a_n} < 1$$

For a sequence $\{a_n\}$ if the ratio of successive terms is known as:

- ▶ Increasing
- ▶ Decreasing
- ▶ Nondecreasing
- ▶ Nonincreasing

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

$$\frac{a_{n+1}}{a_n} \geq 1$$

For a sequence $\{a_n\}$ if the ratio of successive terms 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

$$a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots \text{ where } (a \neq 0)$$

If the geometric series
 $|r| < 1$

then which of the following is true for the given series?

- Converges
- Diverges
- Gives no information

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

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

If $\rho > 1$ 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

$$\rho = \lim_{k \rightarrow +\infty} \sqrt[k]{u_k}$$

If $\rho > 1$ 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?

$\lim_{k \rightarrow \infty} a_k = 1$

- $a_1 > a_2 > a_3 \dots > a_k > \dots$
- $a_1 \leq a_2 \leq a_3 \dots \leq a_k \leq \dots$

Question No: 37 (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

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

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

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

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

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

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

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 $2m$ exerts a force of $3N$ when stretched $1m$ beyond its natural length?

- ▶ $3x$
- ▶ $3N/m$
- ▶ $2m$
- ▶ $3m/N$

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 $y = x^2$ and $y = x + 6$.

Sol,

Question No: 43 (Marks: 2)

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

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 $y = \sqrt[3]{3x}$; $0 \leq y \leq 4$ about the x -axis. But do not evaluate the integral.

Question No: 46 (Marks: 3)

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

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

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

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

- Exist
- Does not exist

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

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

- $(\sec x)(\tan x)$
- $(\sec x)(\tan x)$
- $(\operatorname{cosec} x)(\cot x)$
- $(\operatorname{cosec} x)(\tan x)$

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

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

$$\frac{d}{dx}((c)\{h(x)\}) = \underline{\hspace{2cm}}$$

- 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 $\lim_{x \rightarrow -\infty} f(x) = +\infty$ and $\lim_{x \rightarrow +\infty} f(x) = +\infty$ then f has _____ on $(-\infty, +\infty)$

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

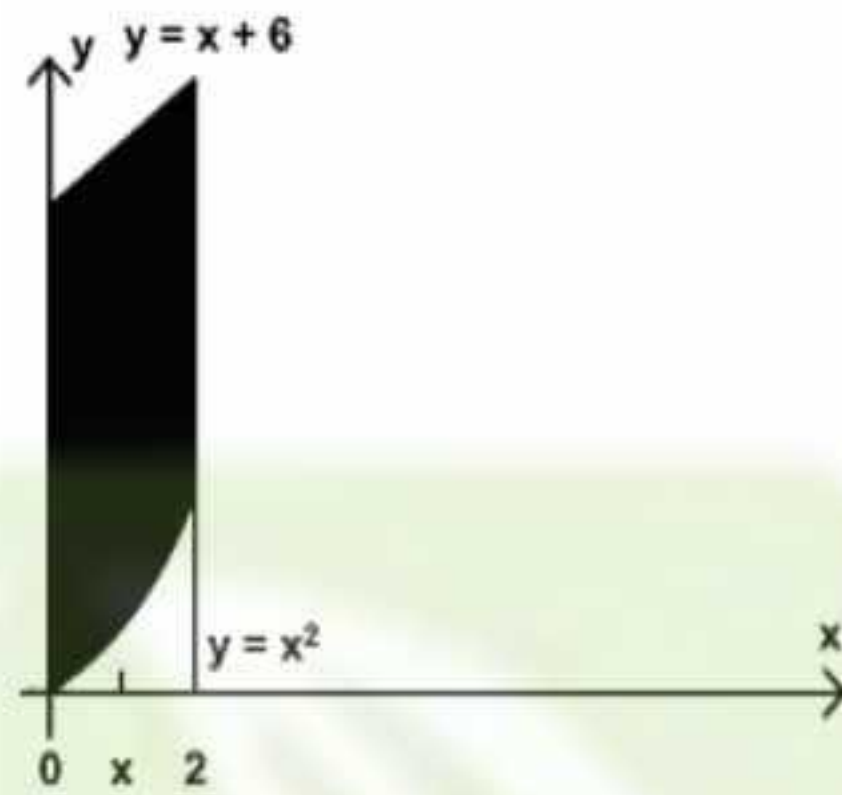
Question No: 5 (Marks: 1) - Please choose one

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]?

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

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

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

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

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

- ▶ $(-\infty, 2) \cup (2, +\infty)$
- ▶ $(-\infty, 2)$
- ▶ $(-\infty, 0)$

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

Tan(x) is continuous every where except at points

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

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

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

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = \text{-----}$$

- ▶ -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

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

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

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

▶

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

▶

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

▶

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

▶

Question No: 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

$$f'(x_n) = 0 \text{ for some } n$$

For a function f , let

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 continuous 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?

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

$$\frac{n(2n)(2n+1)}{6}$$

▶

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

▶

$$\left[\frac{n(n+2)}{2} \right]^2$$

▶

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

▶

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

$$\frac{5}{7} \times 1^2 + \frac{5}{7} \times 2^2 + \frac{5}{7} \times 3^2 + \frac{5}{7} \times 4^2 \dots + \frac{5}{7} \times n^2 = \underline{\hspace{2cm}}$$

$$\frac{5n(n+1)(2n+1)}{42}$$

▶

$$\frac{5n(n+1)}{14}$$

▶

$$\frac{5n^2(n+1)^2}{14}$$

▶

$$\frac{5(n+1)(2n+1)}{42}$$

▶

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

$$\int_a^a f(x) dx = \underline{\hspace{2cm}}$$

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 $a_1 > a_2 > a_3 > \dots > a_n > \dots$, 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:

- ▶ 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

Which of the following option is true for the sequence $a_n = \left\{ \frac{1}{n} \right\}_{n=1}^{\infty}$?

- ▶ 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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $\rho = \lim_{k \rightarrow +\infty} \frac{u_{k+1}}{u_k}$ 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 $\rho = \lim_{k \rightarrow +\infty} \sqrt[k]{u_k}$ 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?

- ▶ **$\lim_{k \rightarrow \infty} a_k = 1$**
- ▶ $a_1 > a_2 > a_3 \dots > a_k > \dots$
- ▶ $a_1 \leq a_2 \leq a_3 \dots \leq a_k \leq \dots$

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 ?

▶ $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^k}{k!} + \dots$

▶ $x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^k}{k!} + \dots$

▶ $1 + x + \frac{x^3}{3!} + \dots + \frac{x^k}{k!} + \dots$

▶ $1 - x + \frac{x^3}{3!} - \dots - \frac{x^k}{k!} - \dots$

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 $2m$ exerts a force of $3N$ when stretched $1m$ beyond its natural length?

- ▶ $3x$
- ▶ $3 N/m$
- ▶ $2 m$
- ▶ $3 m/N$

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 $y = x^2$ and $y = x + 6$.

Sol,

Question No: 43 (Marks: 2)

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

Question No: 44 (Marks: 3)

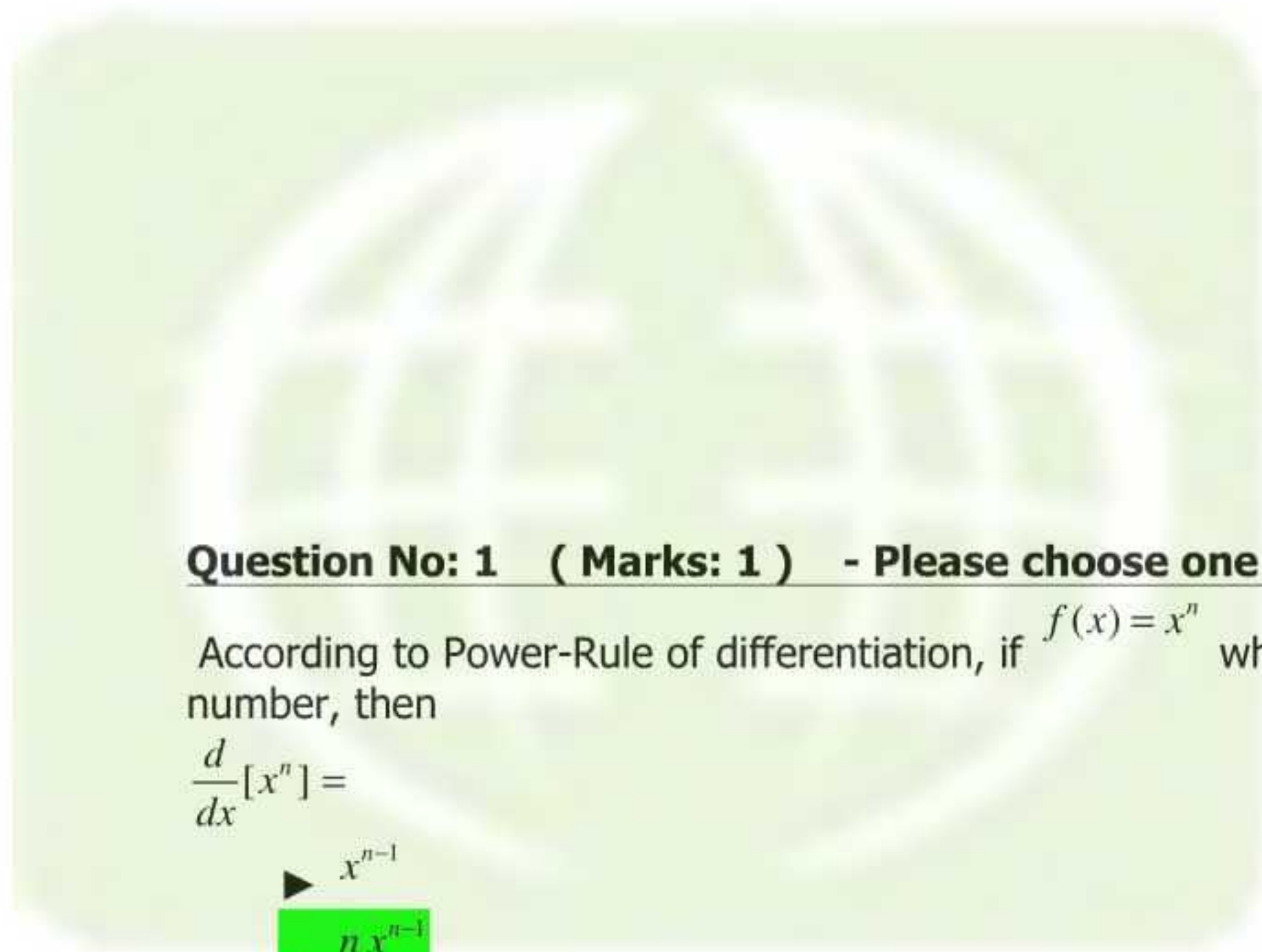
Evaluate the following integral:

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

Question No: 45 (Marks: 3)

Find a definite integral indicating the area of the surface generated by revolving

the curve $y = \sqrt[3]{3x}$; $0 \leq y \leq 4$ about the x -axis. But do not evaluate the integral.



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

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

$$y = f(g(h(x)))$$

If

$$u = g(h(x))$$

$$v = h(x) \quad \frac{dy}{dx} = \underline{\hspace{2cm}}$$

then

- ▶ **$\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$**
- ▶ $\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$
- ▶ $\frac{dv}{du} \cdot \frac{du}{dv} \cdot \frac{dy}{dx}$
- ▶ _____

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

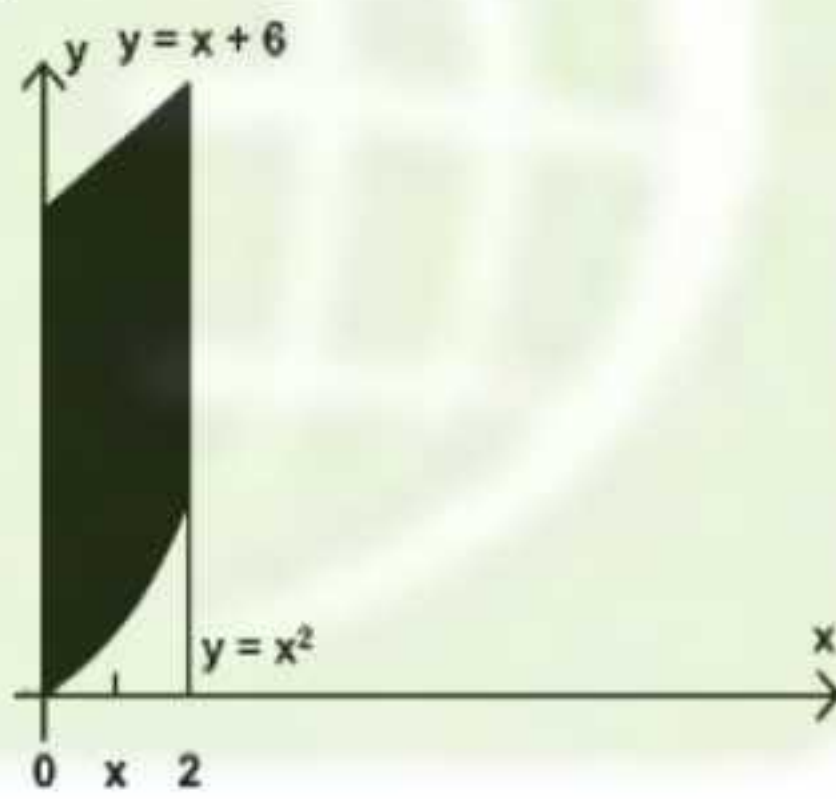
$$\int cf(x)dx = \underline{\hspace{2cm}}$$

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: $y = x^2$ 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: 9 (Marks: 1) - Please choose one

What is the sum of following series?

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

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

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 $y = \sqrt{x}$; $x=1, x=4$ 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

$\lim_{x \rightarrow a} f(x) = \dots\dots\dots$ 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

$$\log_b \frac{1}{t} = \underline{\hspace{2cm}}$$

- ▶ $\log_b t$
- ▶ $1 - \log_b t$
- ▶ $1 + \log_b t$
- ▶ $-\log_b t$

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

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

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

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

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

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

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

- Nondecreasing
- Decreasing

- Increasing
- Nonincreasing

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

If $a_1 \geq a_2 \geq a_3 \geq \dots \geq a_n \geq \dots$, 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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $\rho = \lim_{k \rightarrow \infty} \frac{|u_{k+1}|}{|u_k|} > 1$ 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 $y = 4\sqrt{x}$; $1 \leq x \leq 4$ about the x -axis?

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

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

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

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

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 $[0,3]$?

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

$$W = \int_0^3 3x dx$$

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

$$W = \int_3^0 F(x) dx$$

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

$$\int_1^0 f(x) dx = 2 \quad \int_0^5 f(x) dx = 1$$

If $\int_1^5 f(x) dx$ and then which of the following is value of

$$\int_1^5 f(x) dx$$

- ▶ ?
- ▶ -3
- ▶ -1
- ▶ 1
- ▶ 3

Question No: 41 (Marks: 2)

$$\frac{1}{2\sqrt{x}}$$

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 $\rho = \lim_{k \rightarrow +\infty} \sqrt[k]{u_k}$; 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:

$$\int_0^2 f(x) dx \quad \text{where} \quad f(x) = \begin{cases} x^2 & ; 0 \leq x < 1 \\ x^3 & ; 1 \leq x \leq 2 \end{cases}$$

Question No: 45 (Marks: 3)

$$\sum_{k=2}^{\infty} (-1)^{k-1} \frac{2^{k-1}}{(k-1)!}$$

Show that the series converges absolutely.

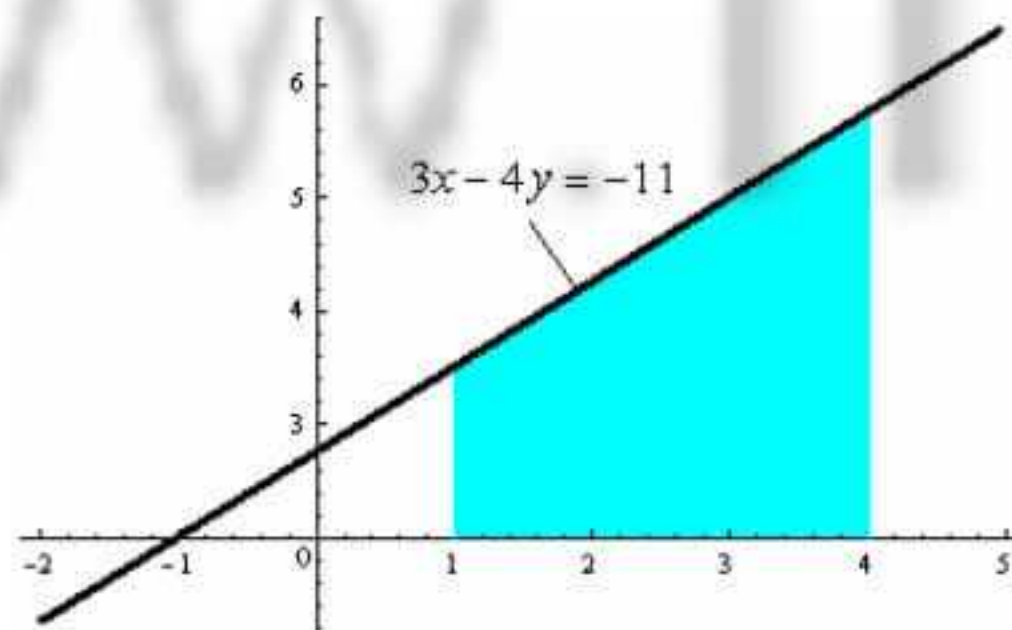
Question No: 46 (Marks: 3)

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)

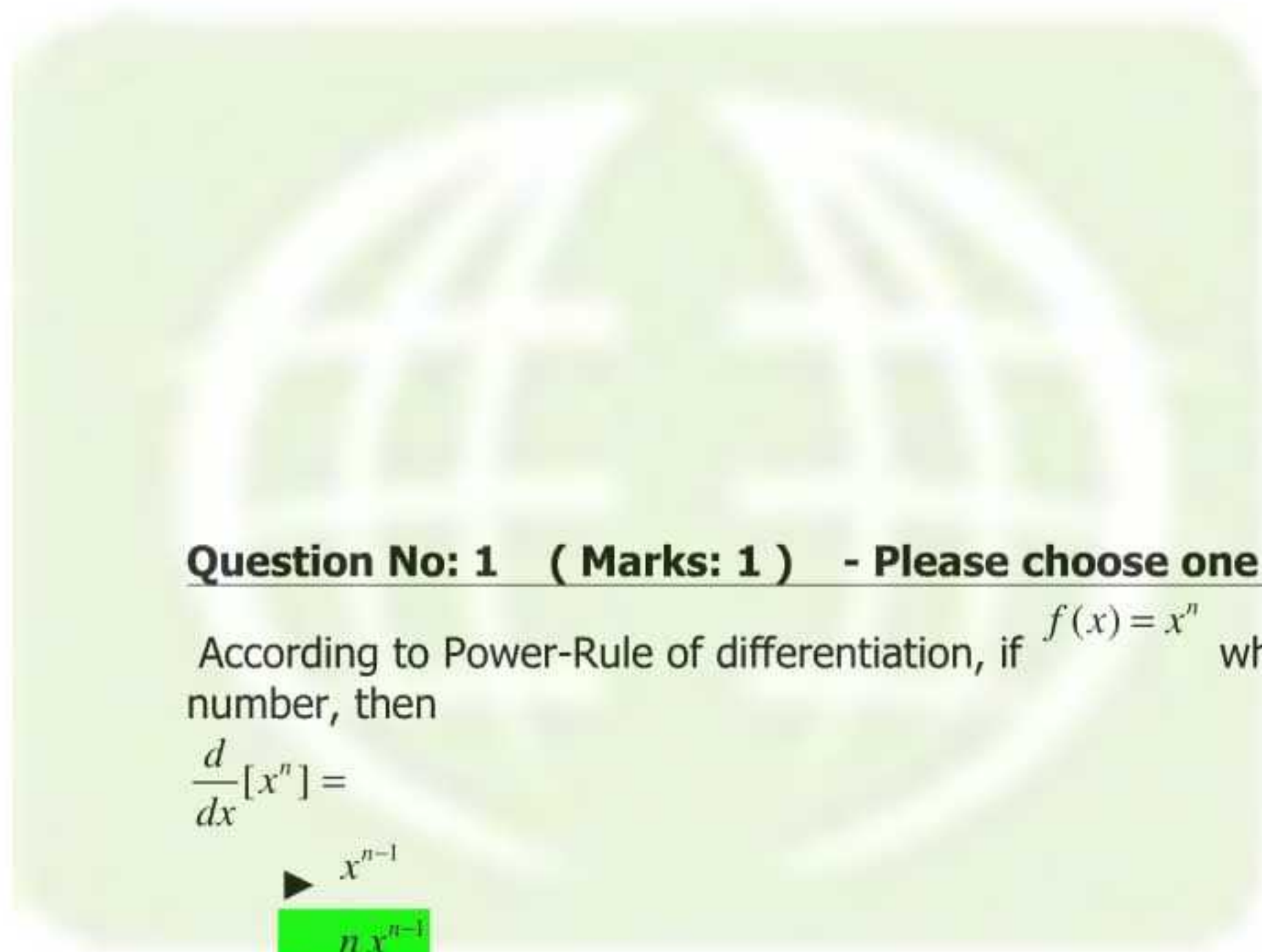
Evaluate the following integral:

$$\int_1^2 \frac{x^2 + \sqrt{x}}{x^2} dx$$

Question No: 50 (Marks: 10)

Use L'Hopital's Rule to evaluate

$$\lim_{x \rightarrow 0} (1 + \sin x)^{\cot x}$$



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

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

$$y = f(g(h(x)))$$

If

$$u = g(h(x))$$

$$v = h(x) \quad \frac{dy}{dx} = \underline{\hspace{2cm}}$$

then

- ▶ **$\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$**
- ▶ $\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$
- ▶ $\frac{dv}{du} \cdot \frac{du}{dv} \cdot \frac{dy}{dx}$
- ▶ _____

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

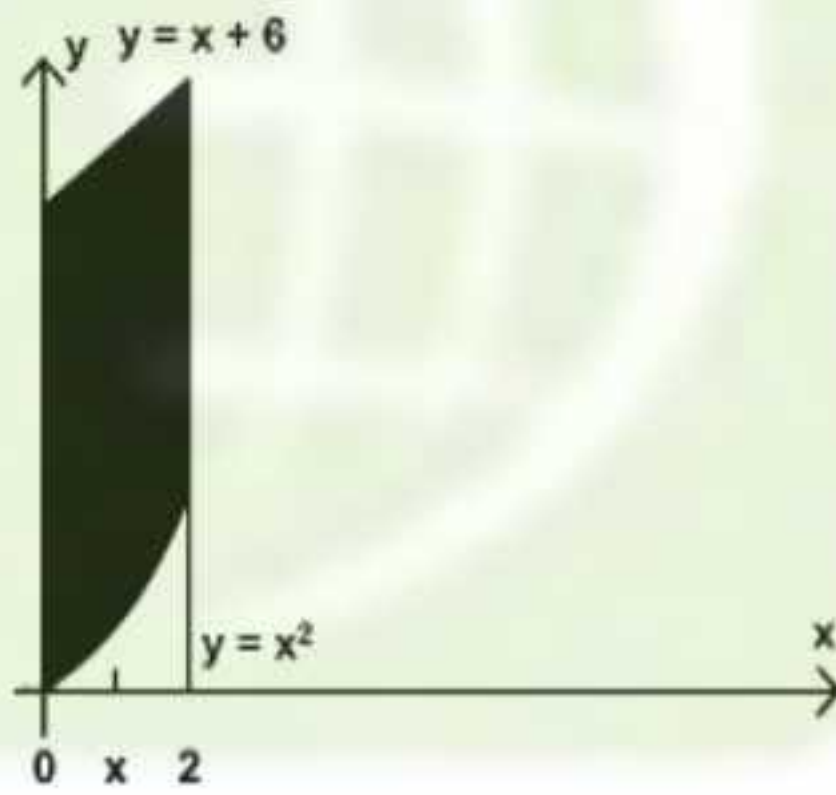
$$\int cf(x)dx = \underline{\hspace{2cm}}$$

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: $y = x^2$ 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: 9 (Marks: 1) - Please choose one

What is the sum of following series?

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

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

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

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

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

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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?

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

- ▶ $V = \int_a^b A(x)dx$

$$V = \int_0^{A(x)} [b-a]dx$$

▶

$$V = \int_0^{A(x)} [b+a]dx$$

▶

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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?

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

▶

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

▶

$$V = \int_0^4 2x \sqrt{x} dx$$

▶

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

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

$$\frac{\pi}{4}$$

▶

$$\frac{\pi}{2}$$

▶

$$\frac{\pi}{5}$$

▶

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The PYTHAGORAS theorem describes the relationship between the sides of

- ▶ Right angle triangle
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- ▶ Two straight lines
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$\lim_{x \rightarrow a} f(x) = \dots\dots\dots$ 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

$$\log_b \frac{1}{t} = \underline{\hspace{2cm}}$$

- ▶ $\log_b t$
- ▶ $1 - \log_b t$
- ▶ $1 + \log_b t$
- ▶ **$-\log_b t$**

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

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

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

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

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The sum is known as:

- ▶ **Riemann Sum**
- ▶ General Sum
- ▶ Integral Sum
- ▶ Geometric Sum

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

What does 'n' represent in the Riemann Sum ?

- ▶ No. of Circles
- ▶ No. of Subintervals
- ▶ No. of Loops
- ▶ **No. of Squares**

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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 :

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- ▶ **Both X-axis and Y-axis**

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

▶ $\sum_{k=0}^5 2k^2$

▶ $\sum_{k=1}^5 2k^2$

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

▶ $\frac{n(n+1)}{4}$

▶ $\frac{[n(n+1)]^2}{8}$

▶ $\frac{n(n+1)(2n+1)}{12}$

▶ $\frac{(n+1)(2n+1)}{6}$

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

- ▶ Nondecreasing
- ▶ Decreasing

- ▶ Increasing
- ▶ Nonincreasing

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

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If the difference between successive terms $a_{n+1} - a_n > 0$ then the sequence

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 - ▶ Decreasing
 - ▶ Nondecreasing
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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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► Nonincreasing

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

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- Diverges
- Gives no information

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- 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 $y = 4\sqrt{x}$; $1 \leq x \leq 4$ about the x -axis?

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

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

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

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

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 $[0,3]$?

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

$$W = \int_0^3 3x dx$$

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

$$W = \int_3^0 F(x) dx$$

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

$$\int_1^0 f(x) dx = 2 \quad \int_0^5 f(x) dx = 1$$

If $\int_1^5 f(x) dx$ and then which of the following is value of

$$\int_1^5 f(x) dx$$

- ?
 - ▶ -3
 - ▶ -1
 - ▶ 1
 - ▶ 3

Question No: 41 (Marks: 2)

$$\frac{1}{2\sqrt{x}}$$

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 $\rho = \lim_{k \rightarrow +\infty} \sqrt[k]{u_k}$; 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:

$$\int_0^2 f(x) dx \quad \text{where} \quad f(x) = \begin{cases} x^2 & ; 0 \leq x < 1 \\ x^3 & ; 1 \leq x \leq 2 \end{cases}$$

Question No: 45 (Marks: 3)

$$\sum_{k=2}^{\infty} (-1)^{k-1} \frac{2^{k-1}}{(k-1)!}$$

Show that the series converges absolutely.

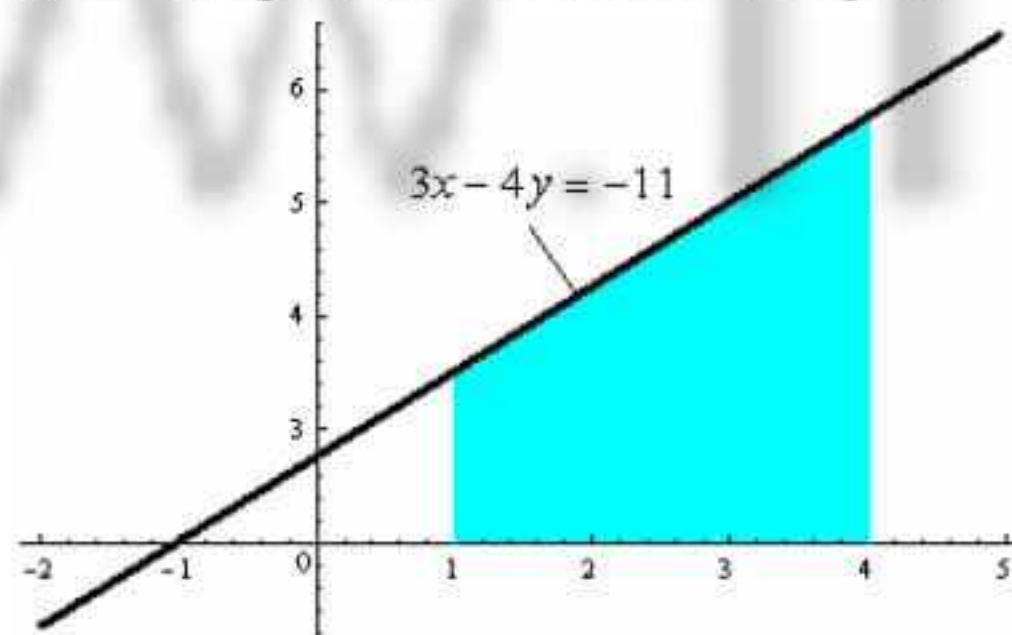
Question No: 46 (Marks: 3)

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

$$\lim_{x \rightarrow 0} (1 + \sin x)^{\cot x}$$

FINAL TERM 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?

▶ $V = \int_0^3 x^2 dx$

▶ $V = 2\pi \int_0^3 \sqrt{x} dx$

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

▶ $V = \int_0^3 x \sqrt[3]{x} dx$

(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 $\rho = \lim_{k \rightarrow +\infty} \sqrt[k]{u_k}$ 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?

- ▶ $\lim_{k \rightarrow \infty} a_k = 1$
- ▶ $a_1 > a_2 > a_3, \dots > a_k > \dots$
- ▶ $a_1 \leq a_2 \leq a_3, \dots \leq a_k \leq \dots$

(Marks: 1) - Please choose one

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

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

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

▶

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

▶

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

▶

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

▶

(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

$f'(x_n) = 0$ for some n

For a function f , let

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

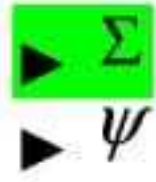
If f and g are continuous function on an interval $[a, b]$ and $f(x) \geq g(x)$ for $a \leq x \leq b$, then area is bounded by the lines parallel to:

- ▶ X -axis
- ▶ Y-axis
- ▶ Both X -axis and Y-axis

(Marks: 1) - Please choose one

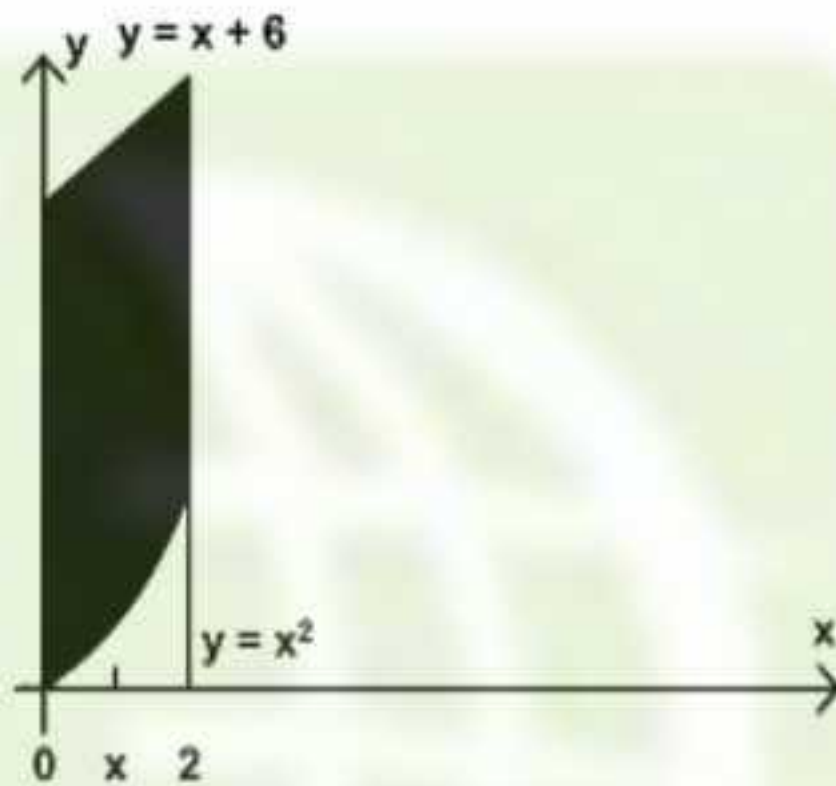
Sigma notation is represented by which of the following Greek letter?

- ▶ χ
- ▶ η



(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

$$\frac{d}{dx}((c) \{h(x)\}) = \underline{\hspace{2cm}}$$

- ▶ 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 $[a, b]$?

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

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

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

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

(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

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

- ▶ Exist
- ▶ Does not exist

(Marks: 1) - Please choose one

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

- ▶ $(\sec x)(\tan x)$
- ▶ $(\sec x)(\tan x)$
- ▶ $(\operatorname{cosec} x)(\cot x)$
- ▶ $(\operatorname{cosec} x)(\tan x)$

(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

$$\lim_{x \rightarrow -\infty} f(x) = +\infty \text{ and } \lim_{x \rightarrow +\infty} f(x) = +\infty$$

If f is continuous function such that 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

Which of the following option is true for the sequence $a_n = \left\{ \frac{1}{n} \right\}_{n=1}^{\infty}$?

- ▶ 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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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 $\rho = \lim_{k \rightarrow +\infty} \frac{u_{k+1}}{u_k}$ 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

- ▶ **$(-\infty, 2) \cup (2, +\infty)$**
- ▶ $(-\infty, 2)$

- ▶ $(-\infty, 0)$

(Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

- ▶ **$\pm \frac{k\pi}{2} (k = 1, 3, 5, \dots)$**
- ▶ $\pm \frac{k\pi}{2} (k = 2, 4, 6, \dots)$
- ▶ $\pm \frac{k\pi}{2} (k = 1, 2, 3, 4, 5, 6, \dots)$

(Marks: 1) - Please choose one

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = \text{-----}$$

- ▶ -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?

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

$$\frac{n(2n)(2n+1)}{6}$$

▶

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

▶

$$\left[\frac{n(n+2)}{2} \right]^2$$

▶

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

▶

(Marks: 1) - Please choose one

$$\frac{5}{7} \times 1^2 + \frac{5}{7} \times 2^2 + \frac{5}{7} \times 3^2 + \frac{5}{7} \times 4^2 + \dots + \frac{5}{7} \times n^2 = \underline{\hspace{2cm}}$$

$$\frac{5n(n+1)(2n+1)}{42}$$

▶

$$\frac{5n(n+1)}{14}$$

▶

$$\frac{5n^2(n+1)^2}{14}$$

▶

$$\frac{5(n+1)(2n+1)}{42}$$

▶

(Marks: 1) - Please choose one

$$\int_a^a f(x) dx = \underline{\hspace{2cm}}$$

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

$$\text{▶ } f'(x)$$

$$\text{▶ } f(x)$$

$$\text{▶ } 0$$

$$\text{▶ } 1$$

(Marks: 1) - Please choose one

If $a_1 > a_2 > a_3 > \dots > a_n > \dots$, 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 $\sum_{k=1}^{\infty} (-1)^n a_k$ 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 ?

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

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

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

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

(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 $[0,3]$?

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

$$W = \int_0^3 3x dx$$

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

$$W = \int_3^0 F(x) dx$$

(Marks: 1) - Please choose one

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

▶ $3x$

▶ $3 N/m$

▶ $2m$

▶ $3 m/N$

(Marks: 2)

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

(Marks: 2)

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

(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 $10N$ is required to stretch a spring from its natural length of $4.8m$ to a length of $6.8m$?

(Marks: 3)

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

(Marks: 5)

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

Let \dots . 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 $x = 1$.

(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?

▶ $V = \int_0^3 x^2 dx$

▶ $V = 2\pi \int_0^3 \sqrt{x} dx$

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

▶ $V = \int_0^3 x \sqrt[3]{x} dx$

(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:

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

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

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

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

(Marks: 1) - Please choose one

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

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

then any function of

- 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?

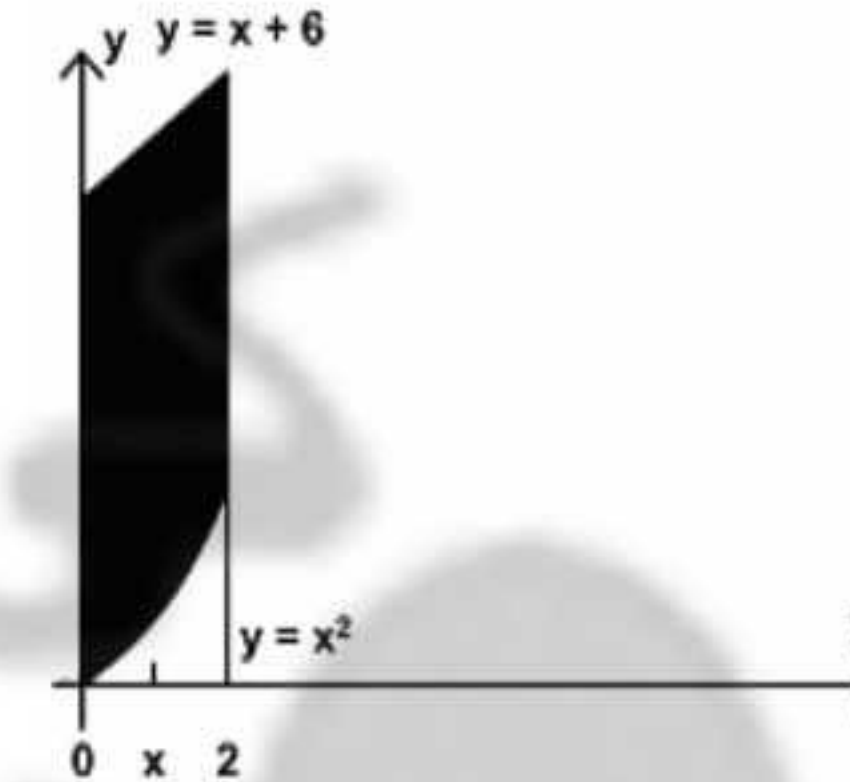
- χ
- η

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]?

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

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

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

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

(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

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

- Exist
- Does not exist

(Marks: 1) - Please choose one

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

- $(\sec x)(\tan x)$
- $(\sec x)(\tan x)$
- $(\operatorname{cosec} x)(\cot x)$
- $(\operatorname{cosec} x)(\tan x)$

(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 $\lim_{x \rightarrow -\infty} f(x) = +\infty$ and $\lim_{x \rightarrow +\infty} f(x) = +\infty$ 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 is known as : $\frac{a_{n+1}}{a_n} \geq 1$ then the sequence

- ▶ 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 $a + ar + ar^2 + ar^3 + \dots + ar^{k-1} + \dots$ 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

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

If $\rho > 1$ 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

$$\frac{(x^2 - 4)}{(x - 2)}$$

Domain of the function $y =$ is

- ▶ $(-\infty, 2) \cup (2, +\infty)$
- ▶ $(-\infty, 2)$

▶ $(-\infty, 0)$

(Marks: 1) - Please choose one

Tan(x) is continuous every where except at points

▶ $\pm \frac{k\pi}{2} (k = 1, 3, 5, \dots)$

▶ $\pm \frac{k\pi}{2} (k = 2, 4, 6, \dots)$

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

(Marks: 1) - Please choose one

$\lim_{x \rightarrow 0} \frac{\sin x}{x} = \text{-----}$

▶ -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?

$1^3 + 2^3 + 3^3 + 4^3 + \text{-----} + n^3$

▶ $\frac{n(2n)(2n+1)}{6}$

▶

▶ $\frac{(n+1)(n+2)}{2}$

▶

▶ $\left[\frac{n(n+2)}{2} \right]^2$

▶

▶ $\left[\frac{n(n+1)}{2} \right]^2$

▶

(Marks: 1) - Please choose one

$\frac{5}{7} \times 1^2 + \frac{5}{7} \times 2^2 + \frac{5}{7} \times 3^2 + \frac{5}{7} \times 4^2 + \dots + \frac{5}{7} \times n^2 = \text{-----}$

▶ $\frac{5n(n+1)(2n+1)}{42}$

▶

▶ $\frac{5n(n+1)}{14}$

▶

$$\frac{5n^2(n+1)^2}{14}$$

▶

$$\frac{5(n+1)(2n+1)}{42}$$

▶

(Marks: 1) - Please choose one

$$\int_a^a f(x)dx = \underline{\hspace{2cm}}$$

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

▶ $f'(x)$

▶ $f(x)$

▶ 0

▶ 1

(Marks: 1) - Please choose one

If $a_1 > a_2 > a_3 > \dots > a_n > \dots$, 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 ?

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

▶

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

▶

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

▶

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

▶

(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 $[0,3]$?

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

▶

$$W = \int_0^3 3x dx$$

▶

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

▶

$$W = \int_3^0 F(x) dx$$

(Marks: 1) - Please choose one

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

▶ $3x$

▶ $3 N/m$

▶ $2m$

► 3 m/V

(Marks: 2)

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

(Marks: 2)

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

(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 10N is required to stretch a spring from its natural length of 4.8m to a length of 6.8m?

(Marks: 3)

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

(Marks: 5)

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

Let $f(x) = \dots$. 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 $x = 1$.

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

$$\lim_{x \rightarrow 0} \frac{\sin 2x}{x} = \text{-----}$$

- 2
- 4

- 1
- ∞

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

$$\lim_{x \rightarrow 0^+} \frac{\ln x}{1/x} = \text{-----}$$

- 1
- 0
- e
- None of these

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

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

- $\sec x$
- $\sec^2 x$
- $\operatorname{cosec} x$
- $\operatorname{cosec}^2 x$

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

$$\frac{d}{dx}((c) \{h(x)\}) = \underline{\hspace{2cm}}$$

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

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

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

The power rule, 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

$$\lim_{x \rightarrow -\infty} f(x) = +\infty \text{ and } \lim_{x \rightarrow +\infty} f(x) = +\infty$$

If f is continuous function such that

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

$$\int cf(x)dx = \underline{\hspace{2cm}}$$

if c is a constant

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

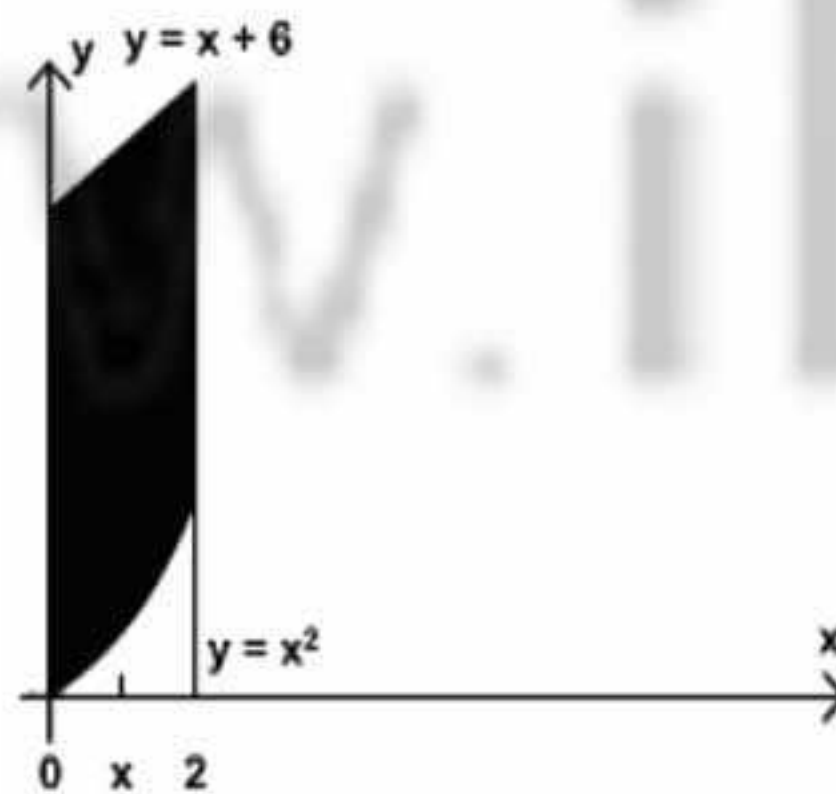
Question No: 16 (Marks: 1) - Please choose one

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 :

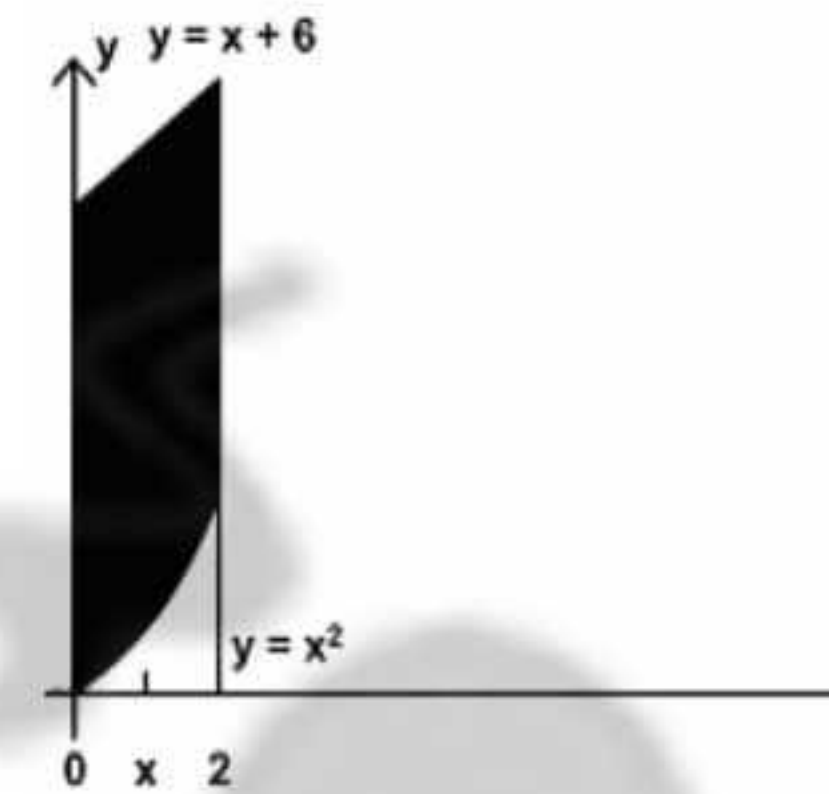


- ▶ $y = x + 6$
- ▶ $y = x^2$
- ▶ $x = 2$

- ▶ $x = 0$

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

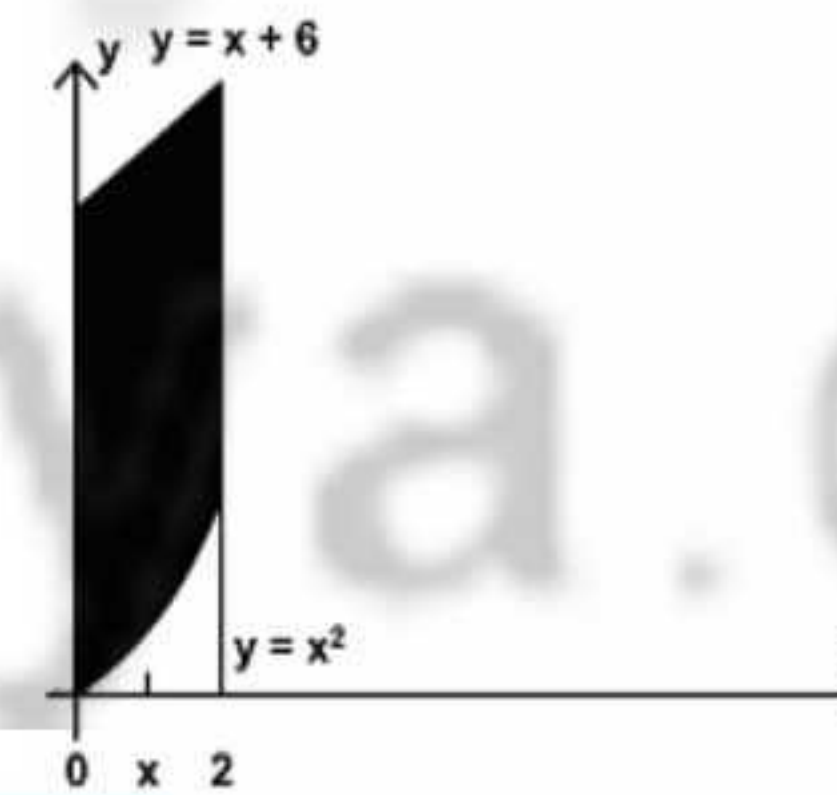
In the following figure, the area bounded on the sides by the lines are :



- ▶ $x = 0$
- ▶ $x = 2$
- ▶ $x = 0$ and $x = 2$
- ▶ $x = 6$

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

What is the area of the region in the following figure?



- ▶ $A = \int_0^2 [(x+6) - (x^2)] dx$
- ▶ $A = \int_x^2 [(x+6) - (x^2)] dx$

$$A = \int_0^2 [(x+6) + (x^2)] dx$$

▶

$$A = \int_0^x [(x+6) - (x^2)] dx$$

▶

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

Which of the following is approximate area under the curve over the interval $[2, 4]$, evaluated by using the formula

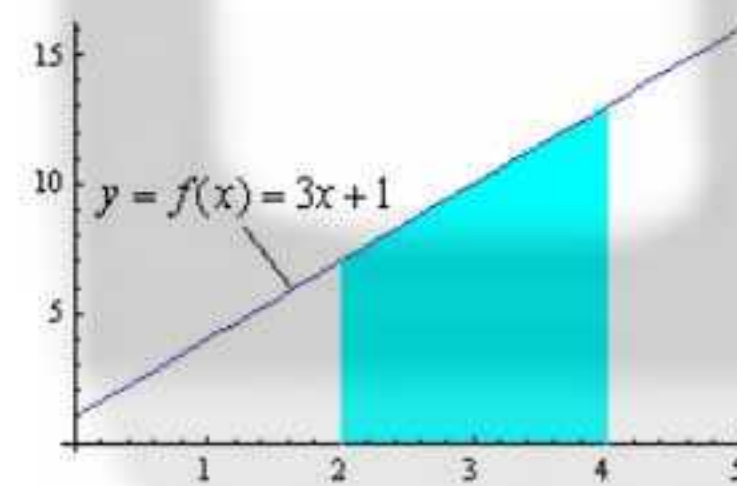
$$\text{Area} = f(x_1^*) \Delta x + f(x_2^*) \Delta x$$

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

$$y = f(x) = 3x + 1$$



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

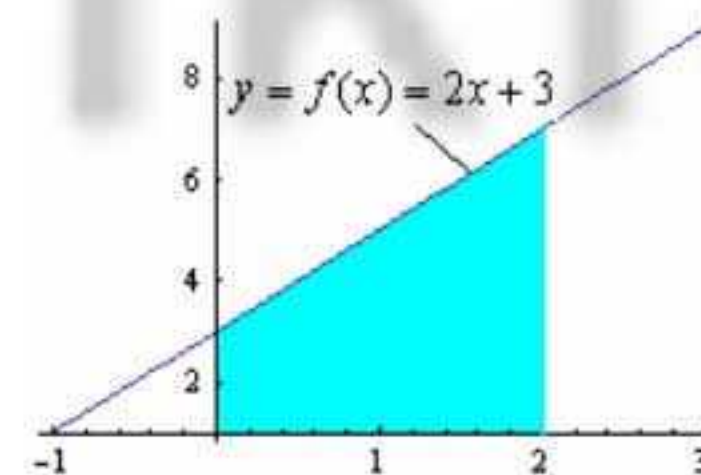
Which of the following is approximate area under the curve over the interval $[0, 2]$, evaluated by using the formula

$$\text{Area} = f(x_1^*) \Delta x + f(x_2^*) \Delta x$$

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
- ▶ 12

$$y = f(x) = 2x + 3$$



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

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

- ▶ $\frac{1}{x}$
- ▶ $\frac{1}{x}$
- ▶ $\ln \frac{1}{x}$

Question No: 23 (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: 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 $[a, b]$?

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n [x_k] [f(x_k)] \quad \text{where } n \text{ is number of subdivisions of } [a, b]$$

$$\int_a^b f(x) dx$$

- ▶ $\pi [\text{radius}]^2$
- ▶ (Width) (Height)

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

Let region R in the first quadrant enclosed between $y = 3x$ and $y = 2x^2$ 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

$$\int_a^b f(x) dx = \lim_{l \rightarrow a} \int_l^b f(x) dx$$

integral defined by

is called :

- ▶ Improper
- ▶ Proper
- ▶ Line

Question No: 28 (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: 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

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

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

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

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

$$\rho = \lim_{k \rightarrow \infty} \sqrt[k]{u_k} = \lim_{k \rightarrow \infty} (u_k)^{\frac{1}{k}}$$

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

$$\sum_{k=1}^{\infty} |u_k| = |u_1| + |u_2| + |u_3| + \dots + |u_k| + \dots$$

If the series $\sum_{k=1}^{\infty} u_k = u_1 + u_2 + u_3 + \dots + u_k + \dots$ converges, then which of

$$\sum_{k=1}^{\infty} u_k = u_1 + u_2 + u_3 + \dots + u_k + \dots$$

the following is true for ?

- ▶ Converges
- ▶ Diverges
- ▶ Gives no information

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

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

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

$$\int_{-1}^1 (x-1) dx = \underline{\hspace{2cm}}$$

- ▶ -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

$$\log_b ac = \underline{\hspace{2cm}}$$

- ▶ $\log_b a + \log_b c$
- ▶ $\log_b a - \log_b c$
- ▶ $\frac{\log_b a}{\log_b c}$
- ▶ $(\log_b a)(\log_b c)$

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

$$\log_b a^r = \underline{\hspace{2cm}}$$

- ▶ $a \log_b r$
- ▶ $r \log_b a$
- ▶ $\frac{\log_b a}{\log_b r}$
- ▶ $\log_b a + \log_b r$

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

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

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

$$\int_2^3 (1-x) dx$$

$$= \left[x - x^2 \frac{1}{2} \right]_2^3$$

$$= \frac{1}{2} [2x - x^2]_2^3$$

$$= \frac{1}{2} (2(3-2) - (3-2)^2)$$

$$= \frac{1}{2} (2-1)$$

$$= \frac{1}{2}$$

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

$$A = \int_1^4 x^2 dx$$

$$= \left[\frac{x^3}{3} \right]_1^4$$

$$= \frac{1}{3} (4-1)^3$$

$$= \frac{1}{3} (3)^3$$

$$= 9$$

Question No: 46 (Marks: 3)

Determine whether the following sequence converges or diverges. If it converges, find the limit.

$$\lim_{n \rightarrow \infty} \frac{5n^2 - 1}{20n + 7n^2}$$

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

$$= \frac{1}{4} \int_{\frac{\pi}{2}}^0 1 + \cos u du$$

$$= \frac{1}{4} [u + \sin u]_{\frac{\pi}{2}}^0$$

$$= \frac{1}{4} [2t + \sin 2t]_{\frac{\pi}{2}}^0$$

$$= \frac{1}{4} (2 \cdot \frac{\pi}{2} + \sin 2 \cdot \frac{\pi}{2})$$

$$= \frac{1}{4} (\pi + \sin \pi)$$

$$= \frac{1}{4} (\pi + 0)$$

$$= \frac{\pi}{4}$$

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 $V = \int_a^b \pi [f(x)]^2 dx$

$$V = \int_1^2 \pi [1 + x^3]^2 dx$$

$$V = \int_1^2 \pi [1 + x^5 + 2x^3] dx$$

$$V = \pi \int_1^2 (1 + x^5 + 2x^3) dx$$

$$V = \pi \left(x + \frac{1}{6}x^6 + \frac{1}{2}x^4 \right) \Big|_1^2$$

$$V = \pi \left((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4 \right)$$

$$V = \pi \left((2-1) + \frac{1}{6}(2-1)^6 + \frac{1}{2}(2-1)^4 \right)$$

$$V = \pi \left(1 + \frac{1}{6} + \frac{1}{2} \right)$$

$$V = \frac{\pi(6+1+3)}{6}$$

$$V = \frac{\pi(10)}{6} = \frac{5\pi}{3}$$

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.