

Calculus & Analytical Geometry-I

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

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

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

▶ x^{n-1}

▶ nx^{n-1}

▶ nx^{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 $(f \circ g)$

▶ Quotient (f / g)

▶ Product $(f \cdot g)$

▶ Sum $(f + g)$

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

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

If

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

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

▶ $\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$

▶ $\frac{dy}{du} \cdot \frac{du}{dv} \cdot \frac{dv}{dx}$

▶ $\frac{dv}{du} \cdot \frac{du}{dv} \cdot \frac{dy}{dx}$

▶

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

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

if c is a constant

- ▶ 0
- ▶ c

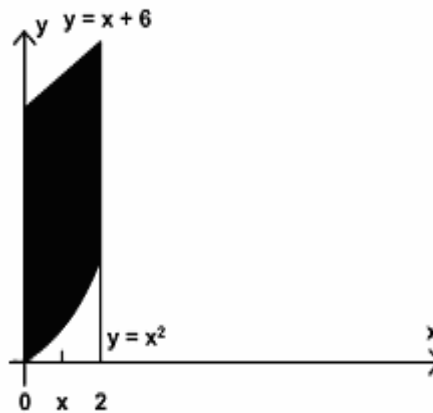
▶ $\int f(cx)dx$

▶ $c \int f(x)dx$

▶

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?

$1 + 2 + 3 + 4 + ______ + n$

▶ $\frac{n+1}{2}$



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



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



▶ $\frac{n(n+1)}{2}$

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

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

Let the solid generated by the region enclosed between
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?

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

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

►
$$\sum_{k=1}^{k=5} (2k + 1)$$

►

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



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

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

The sum is known as:

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

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

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

What does 'n' represent in the Riemann Sum ?

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

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

If w and v are continuous functions of y on an interval $[c, d]$

and $w(y) \geq v(y)$ for $c \leq y \leq d$, then area is bounded by the lines parallel to :

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

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

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

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



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



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



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



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

$$\sum_{k=1}^n \frac{k^3}{2} = \underline{\hspace{2cm}}$$

$$\frac{n(n+1)}{4}$$



$$\frac{[n(n+1)]^2}{8}$$



$$\frac{n(n+1)(2n+1)}{12}$$



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



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

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

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

- ▶ Converges
- ▶ Diverges
- ▶ Gives no information

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

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

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

- ▶ Converges
- ▶ Diverges
- ▶ Gives no information

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

$$\sum_{k=1}^{\infty} u_k$$

$$\sum_{k=1}^{\infty} |u_k|$$

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

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

Let $\sum_{k=1}^{\infty} u_k$ be a series with nonzero terms and suppose that
then which of the following is true?

- ▶ The series $\sum_{k=1}^{\infty} |u_k|$ converges

- $\sum |u_k|$
- ▶ The series 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?

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

▶

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

▶

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

▶

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



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?

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



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



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



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



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

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

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



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



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



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



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

$$\int_1^0 f(x) dx = 2$$

$$\int_0^5 f(x) dx = 1$$

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

If _____ and _____ then which of the following is value of _____ ?

▶ -3

▶ -1

▶ 1

▶ 3

Question No: 41 (Marks: 2)

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

Derivative of a function is _____. Find the original function.

Question No: 42 (Marks: 2)

$$\sum u_k$$

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

If _____ is a series with positive terms and _____ ; 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:

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

Question No: 45 (Marks: 3)

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

Show that the series _____ converges absolutely.

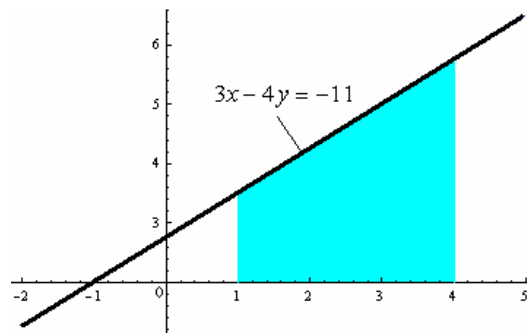
Question No: 46 (Marks: 3)

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

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