

Class : 12

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SECOND MID TERM TEST - 2024

Time Allowed : 1.30 Hours]

MATHEMATICS

[Max. Marks : 50

Part - I

1. Answer all the questions.

YouTube/ Akwa Academy

5x1=5

1. The minimum value of the function $|3-x| + 9$ is

- (a) 9 (b) 6 (c) 3 (d) 0

2. The tangent to the curve $y^2 - xy + 9 = 0$ is vertical when

- (a)
- $y = \pm 3$
- (b)
- $y = \frac{1}{2}$
- (c)
- $y = \pm\sqrt{3}$
- (d)
- $y = 0$

3. The approximate change in the volume V of a cube of side x meters caused by increasing the side by 1% is

- (a)
- $0.03x^2m^3$
- (b)
- $0.03x^2m^3$
- (c)
- $0.03xm^3$
- (d)
- $0.03xdx m^3$

4. The value of $\int_1^{10001} x(1-x)^{99} dx$ is

- (a)
- $\frac{1}{10001}$
- (b)
- $\frac{1}{10100}$
- (c)
- $\frac{1}{10010}$
- (d)
- $\frac{1}{11000}$

5. If $\int_0^a dx \frac{1}{4+x^2} = \frac{\pi}{8}$ then a is

- (a) 2 (b) 3 (c) 1 (d) 4

PART - II

Answer any 5 questions.

5X2=10

6. Evaluate : $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x^2} \right)$ 7. Find slope of the tangent to $f(x) = x^4 + 2x^2 - x$ at $x=1$.8. A particle is fired straight up from the ground to reach a height of s feet in t seconds. where $s(t) = 128t - 16t^2$. Compute the maximum height of the particle reached.9. Find df for $f(x) = x^2 + 3x$, $x = 2$ and $dx = 0.1$.10. Evaluate : $\int_0^{\pi/2} \sin^{10} x dx$ 11. Evaluate : $\int \frac{2x}{1+x^2} dx$

PART - III

Answer any five questions.

5X3=15

12. Find the equations of tangent and normal to the curve $y = x^3 + 3x - 2$ at $(1,2)$

13. Find two positive numbers whose product is 20 and their sum is minimum.

TPR/12/ Mat /1

14. If $u(x,y) = \log(x^2 + y^2 + z^2)$, find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$
15. A circular plate expands uniformly under the influence of heat. If its radius increases from 10.5 cm to 10.75 cm, then find an approximate change in the area and the approximate percentage change in the area.
16. Evaluate : $\int_0^{\pi/2} (\sin^2 x + \cos^4 x) dx$
17. Evaluate : $\int_0^{\pi} x \log \left(\frac{3 + \cos x}{3 - \cos x} \right) dx$

PART - IV

Answer All the questions.

4X5=20

18. (a) If the curves $ax^2 + by^2 = 1$ and $cx^2 + dy^2 = 1$ intersect each other orthogonally then, show that

$$\frac{1}{a} - \frac{1}{b} = \frac{1}{c} - \frac{1}{d}$$

(OR)

- (b) If $u = \sin^{-1} \left(\frac{x+y}{\sqrt{x} + \sqrt{y}} \right)$, Show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$.

19. (a) Sketch the curve $f(x) = x^2 - x - 6$

(OR)

- (b) Evaluate : $\int_x^{\pi} \frac{\cos^2 x}{1+a^x} dx$.

20. (a) Using integration, find the area of the region bounded by the triangle whose vertices are (-1,1), (-3,2), and (0,5)

(OR)

- (b) Find the angle between $y = x^2$ and $y = (x-3)^2$

21. (a) If we blow air into a balloon of spherical shape at the rate of 1000 cm³ per second. At what rate the radius of the balloon changes when the radius is 7cm? Also compute the rate at which the surface area changes.

(OR)

- (b) Find the area of the region bounded between the parabola $x^2 = y$ and the curve $y = |x|$

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