RK VISION ACADEMY

NEET | IIT – JEE | FOUNDATIONS

MATRIC PRACTICE PAPER (2024)

(Mathematics)

Grade: XII   **Marks: 40 marks**
Chapter: Applications Of Differential Calculus   **Time: 90 minutes**

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SECTION A   (10x1=10)

Choose the correct option.

1. The position of a particle moving along a horizontal line of any time t is given by s(t)=3t^2-2t-8. The time at which the particle is at rest is
   (a) t=3   (b) t=0   (c) t=$\frac{1}{3}$ (d) t=1

2. the least possible perimeter (in m) of a rectangle of area 100m^2 is
   (a) 50   (b) 10   (c) 20   (d) 40

3. The abscissa of the point on the curve f(x)=$\sqrt{8-2x}$ at which the slope of the tangent is -0.25?
   (a) -2   (b) -8   (c) 0   (d) -4

4. The minimum value of the function |3-x|+9 is
   (a) 6   (b) 0   (c) 9   (d) 3

5. The volume of the sphere is increasing in volume at the rate of 3π cm^3/sec. The rate of change of its radius when radius is $\frac{1}{2}$cm is
   (a) 3cm/sec   (b) 2cm/sec   (c) 1cm/sec   (d) $\frac{1}{2}$cm/sec

6. The slope of the line normal to the curve f(x) = 2cos4x at x=$\frac{\pi}{12}$ *is*
   (a) -4$\sqrt{3}$ (b) -4   (c) $\frac{\sqrt{3}}{12}$ (d) 4$\sqrt{3}$

7. The value of $\lim_{x\to0}(cotx-\frac{1}{x})$ is
   (a) 0   (b) 1   (c) 2   (d) ∞

8. The curve $y=ax^4+bx^2$ with a,b>0
   (a) has no horizontal tangent   (b) is concave up
   (c) is concave down   (d) has no point of infection

9. The number given by the Mean value theorem for the function $\frac{1}{x}$, $x\epsilon[1,9]$ is
   (a) 2   (b) 2.5   (c) 3   (d) 3.5

10. The function $\sin^4 x+\cos^4 x$ is increasing in the interval
    (a) $[\frac{5\pi}{8},\frac{3\pi}{4}]$ (b) $[\frac{\pi}{2},\frac{5\pi}{8}]$ (c) $[\frac{\pi}{4},\frac{\pi}{2}]$ (d) $[0,\frac{\pi}{4}]$

SECTION B   (3x2=6)
Answer the following.

11. Find the points on the curve $y=x^3-3x^2+x-2$ at which the tangent is parallel to the line y=x.

12. Find the equation of tangent to the curve $y=x^2-x^4$ at (1,0).

13. Find the Maclaurin series for log(1+x) up to 4 non-zero terms for $-1\leq x \leq 1$.

SECTION C   (3x3=9)
Answer the following.

14. Find the intervals of monotonicity and hence find the local extremum for the function $f(x)=2x^3+3x^2-12x$.

15. Evaluate: $\lim\limits_{x\to\infty} \frac{2x^2-3}{x^2-5x+3}$.

16. Find the local extrema of the function $f(x)=x^4+32x$.

SECTION D   (3x5=15)
Answer the following.

17. Salt is poured from a conveyer belt at a rate of 30 cubic metre per minute forming a conical pile with a circular base whose height and diameter of base are always equal. How fast if the height of the pile increases when the pile is 10metre high.

18. Prove that among all the rectangles of the given area, square has the least perimeter.

19. Prove that the ellipse $x^2+4y^2=8$ and the hyperbola $x^2-2y^2=4$ intersect orthogonally.