1. Find the intervals in which the functions $f(x) = x^3 - 6x^2 + 9x + 15$ is increasing.

(a) $(-\infty, 1) \cup (3, \infty)$ (b)$x > -3$(c)$[-\infty, 1] \cup [2, \infty]$ (d) None of these

2. The value of a, for which the function $f(x) = a\sin x + \frac{1}{3}\sin 3x$ has an extremum at $x = \frac{\pi}{3}$, is

    (a) 1   (b) -1   (c)0   (d) 2.

3. A particle P moves along the curve $x^2y^3 = 27$ and dy/dt = 10 at the time when P is at the point (1, 3). What is the value of dx/dt at that instant?

    (a) 5   (b)– 10   (c) 10   (d) – 10

4. The normal at the point (1, 1) on the curve $2y = 3 - x^2$ is
    (a) x + y = 0   (b) x + y = -1
    (c) x - y = -1   (d) x—y = 0

5. Angle between the curves $y = \sin x,\ y = \cos x$ is

    (a) $\dfrac{\pi}{4}$ (b) $\tan^{-1}\sqrt{2}$

    (c) $\tan^{-1} 2\sqrt{2}$ (d)   None of these

6.   Equation of the normal line to the curve $y = x\log x$ parallel to $2x - 2y + 3 = 0$ is

    (a) $x - y = 3e^{-2}$ (b) $x - y = 6e^{-2}$ (c) $x - y = 3e^{2}$ (d)None of these

7.   On the ellipse $4x^2 + 9y^2 = 1$, the points at which the tangents are parallel to the line $8x = 9y$ are

    (a) $\left(\dfrac{2}{5},\dfrac{1}{5}\right)or\left(\dfrac{1}{5},\dfrac{2}{5}\right)$(b) $\left(-\dfrac{2}{5},\dfrac{1}{5}\right)$or $\left(\dfrac{2}{5},-\dfrac{1}{5}\right)(c)-\left(\dfrac{2}{5},\dfrac{1}{5}\right)$ (d) $\left(-\dfrac{1}{5},-\dfrac{2}{5}\right)$

8.   The points on the curve $9y^2 = x^3$, where the normal to the curve makes equal intercepts with the axis is

(a) $\left(4,\frac{8}{3}\right)$ or $\left(4,-\frac{8}{3}\right)$ (b) $\left(-4,\frac{8}{3}\right)$ (c) $\left(-4,-\frac{8}{3}\right)$ (d) None of these

9. The slope of the tangent to te curve $y = \frac{x-1}{x+2}$ $at x = 2\ is$:

(a) 3/16 (b) $-3/16$ (c) 1/4 (d) $-1/4$

10. If the slope of the normal to the curve $x^3 = 8a^2 y, a > 0$ at a point in the first quadrant is $-2/3$, then the point is

(a) (2a, - a) (b) (2a, a) (c) (a, 2a) (d) (a, a)

11. Find the interval in which function $f(x) = x^2 / e^x$ is monotonically increasing.

12 Find an interval in which f (x) = Cos x is monotonic decreasing.

13 What are the points on the curve $x^2 + y^2 - 2x - 3 = 0$ where the tangents are parallel to x-axis?

14. What is the rate of change of $\sqrt{x^2 + 16}$ with respect to x^2 at $x = 3$?

15. Find the approximate value of $\sqrt{0.037}$

16. An edge of a variable cube is changing at the rate of 10 cm / sec, how fast is the volume of cube is increasing when the edge is 5 cm long?

17. A man 2 m high walks at a uniform speed 6 m / min away from a lamp post, 5 m high. Find the rate at which the length of his shadow increases?

18. An inverted cone has depth 10 cm and base radius 5 cm, water is pouring into it at 1.5 cm^3 per minute, Find the rate at which the level of water is rising in the cone when depth is 4 cm.

19. Find the shortest between the line y – x = 1 and the curve x = y ^{2}.

20. Prove that a conical tent of given capacity will require the least amount of canvas when the height is $\sqrt{2}$ times the radius of base .