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Dept: MBBS

Matric no: 19/MHS01/360

Serial no: 418

Course code: mat 104

Assignment 6

2. $y = 3x^2$ at the point (2, 8)

$$\frac{dy}{dx} = 6x$$

$$\frac{dy}{dx} \Big|_{x=2} = 6(2) = 12$$
$$m = 12$$

$$x_1 = 2, y_1 = 8$$

$$y - y_1 = m(x - x_1)$$

$$y - 8 = 12(x - 2)$$

$$y - 8 = 12x - 24$$

$$12x - y - 24 + 8 = 0$$

$$12x - y - 16 = 0 \quad \text{--- Equation of tangent}$$

Equation of normal

$$y - y_1 = \frac{-1}{m} (x - x_1)$$

$$y - 8 = \frac{-1}{12} (x - 2)$$

$$12(y - 8) = -1(x - 2)$$

$$12y - 96 = -x + 2$$

$$x + 12y - 98 - 2 = 0$$

$$x + 12y - 100 = 0$$

3. $y = \frac{x^3}{2}$ at the point (-1, $-\frac{1}{2}$)

$$y = \frac{x^3}{2}$$

$$\frac{dy}{dx} = \frac{1}{2} \cdot 3x^2 = \frac{3}{2}x^2$$

$$\frac{dy}{dx} = \frac{3}{2}x^2$$

$$\frac{dy}{dx} \Big|_{x=-1} = \frac{3}{2}(-1)^2 = \frac{3}{2}$$

$$m = \frac{3}{2}$$

$$x_1 = -1, y_1 = -\frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y + \frac{1}{2} = \frac{3}{2}(x + 1)$$

$$\frac{2y + 1}{2} = \frac{3}{2}(x + 1)$$

$$2(2y + 1) = 6(x + 1)$$

$$4y + 2 = 6x + 6$$

$$6x - 4y + 6 - 2 = 0$$

$$6x - 4y + 4 = 0 \quad \text{--- Equation of the tangent}$$

Equation of the normal

$$y - y_1 = \frac{-1}{m} (x - x_1)$$

$$y + \frac{1}{2} = \frac{-1/3}{2} (x + 1)$$

$$\frac{2y+6}{2} = -2 \quad (\text{const})$$

$$2(2y+6) = -4(x+6)$$

$$4y+12 = -4x-24$$

$$4x+6y+36 = 0$$

$$4x+6y+72 = 0$$

4. $y = 1 + 2x - 3x^2$ at the point $(-2, -5)$

$$\frac{dy}{dx} = -2x + 1$$

$$\frac{dy}{dx} \Big|_{x=-2} = -2(-2) + 1 = 5$$

$$x_1 = -2, y_1 = -5$$

$$y - y_1 = m(x - x_1)$$

$$y + 5 = 5(x + 2)$$

$$y + 5 = 5x + 10$$

$$y + 5 = 5x + 10$$

$$5x - y + 10 - 5 = 0$$

$$5x - y + 5 = 0 \quad \text{Equation of tangent}$$

Equation of normal

$$y - y_1 = -\frac{1}{m}(x - x_1)$$

$$y + 5 = -\frac{1}{5}(x + 2)$$

$$5(y + 5) = -(x + 2)$$

$$5y + 25 = -x - 2$$

$$x + 5y + 27 = 0$$

$$x + 5y + 27 = 0$$

$$3y - 1 = 27x - 81$$

$$27x - 3y - 81 + 1 = 0$$

$$27x - 3y - 80 = 0$$

5. $y = \frac{1}{x}$ at the point $(3, \frac{1}{3})$

$$y = x^{-1}$$

$$\frac{dy}{dx} = -x^{-2}$$

$$\left. \frac{dy}{dx} \right|_{x=3} = -\frac{1}{9}$$

$$m = -\frac{1}{9}$$

$$x_1 = 3, y_1 = \frac{1}{3}$$

$$y - y_1 = m(x - x_1)$$

$$\frac{y - \frac{1}{3}}{1} = -\frac{1}{9} (x - 3)$$

$$\frac{3y - 1}{3} = -\frac{1}{9} (x - 3)$$

$$9(3y - 1) = -3(x - 3)$$

$$27y - 9 = -3x + 9$$

$$3x + 27y - 18 = 0$$

$$x + 9y - 6 = 0 \text{ - Equation of tangent}$$

Equation of normal

$$y - y_1 = \frac{-1}{m} (x - x_1)$$

$$y - \frac{1}{3} = -\frac{1}{-\frac{1}{9}} (x - 3)$$

$$\frac{3y - 1}{3} = 9(x - 3)$$

$$3y - 1 = 27(x - 3)$$

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Answer:

1.

$y = 2x^2$ at point $(1, 2)$

$$\frac{dy}{dx} = 4x$$

$$\left. \frac{dy}{dx} \right|_x = 4 = 4(1) = 4$$

$$m = 4$$

$$x_1 = 1, y_1 = 2$$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = 4(x - 1)$$

$$y - 2 = 4x - 4$$

$$4x - y - 4 + 2 = 0$$

$$4x - y - 2 = 0 \text{ - Equation of tangent}$$

for Equation of Normal

$$y - y_1 = \frac{-1}{m} (x - x_1)$$

$$y - 2 = \frac{-1}{4} (x - 1)$$

$$4(y - 2) = -1(x - 1)$$

$$4y - 8 = -x + 1$$

$$x + 4y - 8 - 1 = 0$$

$$x + 4y - 9 = 0$$

