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MATRIC:- 19/MH301/102
MAT 104
Assignment:

Find the Equation of the tangent and the Equation of the Normal.

Question 1

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

Solution.

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

$m = 4$

$\therefore$ Equation of tangent at $(1, 2)$ $[y - y_1 = m(x - x_1)]$

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

$y - 2 = 4x - 4$

$y = 4x - 2$

$\therefore$ Equation of normal at $(1, 2)$ $\left[y - y_1 = \frac{-1}{m}(x - x_1)\right]$

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

$4y - 8 = -1(x - 1)$

$4y - 8 = -x + 1$

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

$y = \frac{-x + 9}{4}$

Question 2

$y = 3x^2 - 2$ at $(2, 8)$

solution:

$y' = 6x - 2 = 6(2) - 2 = 12 - 2 = 10$

$m = 10$

$\therefore$ Equation of tangent at $(2, 8)$

$y - y_1 = m(x - x_1)$ $\quad y - 8 = 10(x - 2)$

$y - 8 = 10x - 20$

$y = 10x - 20 + 8$

$y = 10x - 12$

$\therefore$ Equation of normal at $(2, 8)$ $\quad y - y_1 = \frac{-1}{m}(x - x_1)$

$y - y_1 = \frac{-1}{10}(x - x_1)$

$y - 8 = \frac{-x + 2}{10}$

multiply thrugh by 10

$10y = -x + 82$

$y = \frac{-x + 82}{10}$

Question 3

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

<u>solution.</u>

$$y' = \frac{3x^2}{2} = \frac{3}{2}, \quad m = \frac{3}{2}$$

$\therefore$ Equation of tangent

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

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

$\therefore$ Equation of normal $y - y_1 = \frac{-1}{m}(x - x_1)$

$$y + 1/2 = -1/(3/2)\,(x - x_1)$$

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

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

$$y = \frac{-2x-2}{3} - \frac{1}{2}$$

$$y = \frac{-4x-4-3}{6} = \frac{-4x-7}{6}$$

Question 4

$y = 1 + x - x^2$ at $(-2, -5)$

solution

$y' = 1 - 2(x)$

$y' = 1 - 2(-2)$

$y' = 1 + 4 = 5$, $m = 5$

$\therefore$ Equation of tangent at $(-2, -5)$

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

$y + 5 = 5x + 10$

$y = 5x + 5$

$\therefore$ Equation of normal at $(-2, -5)$

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

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

$5y + 25 = -x + 2$

$5y = -x + 2 - 25$

$y = \frac{-x - 23}{5}$

Question 5

$y = 1/x$ at $(3, 1/3)$

solution

$m = y' = \frac{-1}{x^2} = -\frac{1}{9}$

Equation of tangent

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

$y = -\frac{1}{9}x + \frac{2}{3}$ //

Equation of the normal at $(3, 1/3)$

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

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

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

$y - \frac{1}{3} = 9x - 27$

$y = 9x - 27 + \frac{1}{3}$

$3y = 27x - 81 + 1$

$y = \frac{27x - 81 + 1}{3}$ //