[illegible]
MATH 104
MBBS
19/MHS01/180

Find the equation of (i) Tangent (ii) Normal of the [illegible]

1. $y = 2x^2$
$(1, 2)$

<u>Solution</u>

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

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

$m_1 = 4$

Then the equation of the tangent would be using

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

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

$y - 2 = 4x - 4$

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

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

The equation of the normal

$m_2 m_1 = -1$

Such that

$m_2 = \frac{-1}{m_1} = \frac{-1}{4}$

$y - y_0 = m(x - x_1)$

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

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

multiply through by 4

$4y - 8 = -x + 1$

$4y + x = 1 + 8$

$4y + x = 9$

2. $y = 3x^2 - 2x$

$(2, 8)$

solution

$\frac{dy}{dx} = 6x - 2$

$m = \left.\frac{dy}{dx}\right|_{x=2} = 6(2) - 2 = 12 - 2$

$\therefore m_1 = 10$

Equation of Tangent using

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

$y - 8 = 10(x - 2)$

$y - 8 = 10x - 20$

$y - 8 + 20 - 10x = 0$

$y + 12 - 10x = 0$

Equation of Normal

$m_2 = \frac{1}{m_1} = -\frac{1}{10}$

$y - 8 = -\frac{1}{10}(x - 2)$

$y - 8 = -\frac{x}{10} + \frac{1}{5}$

multiply through by 10

$10y - 80 = -x + 2$

$10y + x = 80 + 2$

$10y + x - 82 = 0$

(3) $y = x^{3/2}$

$(-1, 1/2)$

solution

$\frac{dy}{dx} = \frac{3x^2 \cdot x^3 - 0}{4}$

$\frac{dy}{dx} = \frac{6x^2 - 0}{4}$

$\frac{dy}{dx} = \frac{6x^2}{4}$

$m = \left.\frac{dy}{dx}\right|_{x=-1} \quad 6 = \frac{6(-1)^2}{4} = \frac{6}{4} = \frac{3}{2}$

$\therefore m = 3/2$

Equation of tangent

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

$y - (-1/2) = 3/2(x - (-1))$

$y + 1/2 = 3/2 x + 3/2$

$2y + 1 = 3x + 3$

$2y + 1 - 3 - 3x = 0$

$2y - 2 - 3x = 0$

Equation of the Normal

$m_2 = -1 \div 3/2$

$m_2 = -2/3$

$y + \frac{1}{2} = -\frac{3}{5}(x+1)$

$y + \frac{1}{2} = -\frac{3x}{5} - \frac{3}{5}$

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

$3y + \frac{7}{2} + x = 0$

$6y + 7 + 2x = 0$ //

4. $y = 1 + x - x^2$

$(-2, -5)$

solution

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

$\left.\frac{dy}{dx}\right|_{x=-2} = 1 - (-2) = 1 + 4 = 5$ $\quad m_1 = 5$

The equation of the tangent

$y - y_1 = 5(x - x_1)$

$y - (-5) = 5[x - (-2)]$

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

$y + 5 = 5x + 10$

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

$y - 5x - 5 = 0$ //

Equation of the Normal

$m_2 = -\frac{1}{5}$

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

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

$5y + 25 = -x - 2$

$5y + x + 25 + 2 = 0$

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

5. $y = \frac{1}{x}$

$(3, \frac{1}{3})$

solution

$\frac{dy}{dx} = -1\, x^{-1-1}$

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

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

$m = \left.\frac{dy}{dx}\right|_{x=3} = -\frac{1}{3^2} = -\frac{1}{9}$ $\quad m_1 = -\frac{1}{9}$

The equation of Tangent

$y - y_1 = -\frac{1}{9}(x - x_1)$

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

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

$9y - 3 = -x + 3$

$9y + x - 3 - 3 = 0$

$9y + x - 6 = 0$ //

Equation of the Normal

$m_2 = -1 \times \frac{1}{-\frac{1}{9}}$

$m_2 = 9$

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

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

$3y - 1 = 27x - 81$

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

$3y - 27x + 80 = 0$