Chima Ovin Chere-Chukwu
19/mhs01/127 MBBS

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

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

$m = \frac{dy}{dx}\Big|_{x=1} \quad \therefore m_1 = 4(1) = 4$

Equation of the tangent

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

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

$y - 2 = 4x - 4$

$y = 4x - 2$

Equation of normal

$m_2 = -1/4$

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

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

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

$4y - 8 = -x + 1$

$4y = -x + 9$

2. $y = 3x^2 - 2x \quad (7, 8)$

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

$m = \frac{dy}{dx}\Big|_{x=2} \quad \therefore m = 6(2) - 2 = 10$

Equation of a tangent

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

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

$y = 10x - 20 + 8$

$y = 10x - 12$

Equation of normal

$m = \frac{-1}{10}$

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

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

$10(y - 8) = -1(x - 2)$

$10y - 80 = -x + 2$

$10y = -x + 82$

3. $y\frac{x^3}{2}$ $(-1, -0.5)$

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

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

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

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

Equation of a tangent

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

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

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

multiply both sides by 2

$2y + 1 = 3(x + 1)$

$2y = 3x + 3 - 1$

$2y = 3x + 2$

Equation of normal

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

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

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

$y + \frac{1}{2} = -\frac{2}{3}(x + 1)$ (multiply both sides by 6)

$6y + 3 = -4(x + 1)$

$6y + 3 = -4x + (-4) - 3$

$6y = -4x - 7$

4 $y = 1 + x - x^2 \quad (-2, -5)$

$\frac{dy}{dx} = 0 + 1 - 2x \therefore \frac{dy}{dx} = 1 - 2x$

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

Equation of tangent

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

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

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

$y + 5 = 5x + 10$

$y = 5x + 5$

Equation of normal

$m = -1/5$

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

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

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

$5(y + 3) = -(x + 2)$

$5y + 10 = -x - 2$

$5y = -x - 12$

5 $y = \frac{1}{x} \quad (3, 1/3)$

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

$m = \frac{dy}{dx}\Big|_{x=3} \quad \therefore m = \frac{-1}{(3)^2} = \frac{-1}{9}$

Equation of a tangent

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

$y - \frac{1}{3} = -\frac{1}{9}(x - 3)$ (multiply both sides by 9)

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

$9y - 3 = -x + 3$

$9y = -x + 6$

Equation of normal

$m = 9$

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

$(y - \frac{1}{3}) = 9(x - 3)$ (multiply both sides by 3)

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

$3y - 1 = 27x - 81$

$3y = 27x - 80$