ORKAA SAMUEL TERUNGWA 19/MHS01/358

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

$x_1 = 1$

$y_1 = 2$

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

$\frac{dy}{dx}|x = 1 = 4 \quad \therefore m = 4$

For equation of tangent

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$ (Equation of the tangent)

Equation of normal.

$m_1 \cdot m_2 = -1$

$4m_2 = -1$

$m_2 = -1/4$

$y - y_2 = \frac{-1}{m}(x - x_1)$

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

$4y - 8 = -x + 1$

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

$4y + x - 9 = 0$ (Equation of the normal)

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

$x_1 = 2$

$y_1 = 8$

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

$\frac{dy}{dx} | x = 2 = 10 \quad \therefore m = 10$

For the equation of tangent,

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

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

$y - 8 = 10x - 20$

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

$y - 10x + 12 = 0$ (for the equation of tangent)

$y - y_1 = -1/m(x - x_1)$

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

$10y - 80 = -x + 2$

$10y + x - 80 - 2 = 0$

$10y + x - 82 = 0$ (for the equation of the normal)

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

$x_1 = -1$ and $y_2 = 1/2$

Apply quotient rule

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

$\frac{dy}{dx}\Big|_{x = x_1} = 3(-1)^2$

$= 3$

Equation of tangent

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

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

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

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

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

$2y + 1 = 6x + 6$

$2y - 6x - 5 = 0$

$6x - 2y + 5 = 0$ [Equation of ~~normal~~ tangent]

Equation of normal.

$y - y_1 = -1/m\,(x - x_1)$

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

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

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

$6y + 3 = -2x - 2$

$6y + 2x + 5 = 0$ (Equation of normal)

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

Solution

$x_1 = -2$ and $y_1 = -5$

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

$\frac{dy}{dx}\Big|_{x=-2}$

$1 - 2(-2) = 1 + 4 = 5 \therefore m = 5$

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

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

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

$y + 5 = 5x + 10$

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

$y - 5x - 5 = 0$ (Eqn for tengent)

EQUATION FOR NORMAL.

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

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

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

multiply through by 5.

$5y + 25 = -1(x + 2)$

$5y + 25 = -x - 2$

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

$5y + x + 27 = 0$ (Equation for normal)

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

Solution : $x_1 = 3$ $y_1 = 1/3$

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

$\frac{dy}{dx}\Big|_{x=3} = \frac{-1}{3^3} = \frac{-1}{27} \therefore m = \frac{-1}{27}$

Equation of tengent.

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

$y - 1/3 = \frac{-1}{27}(x - 3)$

$27y - 9 = -x + 3$

$27y - 9 + x - 3 = 0$

$27y + x - 9 - 3 = 0$

$27y + x - 12 = 0$ [Equation for tengent]

EQUATION FOR NORMAL.

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

$y - 1/3 = -\left(\frac{-1}{27}\right)(x - 3)$

$y - 1/3 = \frac{1}{27}(x - 3)$

$27y - 9 = x - 3$

$27y - x - 9 + 3 = 0$

$27y - x - 6 = 0$ (Eqn for normal)