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

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

$\frac{dy}{dx}|_1 = 4(1)$

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

$m = 4$

$m_1 = 4, \quad x_1 = 1, \quad y_1 = 2$

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

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

$y - 4x + 2 = 0$

equation of a tangent

$m_1 m_2 = -1$

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

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

$4y - 8 = -x + 1$

$4y + x - 9 = 0$

Equation of a normal

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

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

$\frac{dy}{dx}|_2 = 6(2) - 2$

$\frac{dy}{dx} = 10$

$m = 10$

$m_1 = 10 \quad x_1 = 2 \quad y_1 = 8$

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

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

$y - 10x + 12 = 0$

Equation of a tangent

(2)

$m_1 m_2 = -1$

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

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

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

$10y - 80 = -x + 2$

$10y + x - 82 = 0$

Equation of a normal

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

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

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

$m = \frac{3}{2} \quad x_1 = -1 \quad y_1 = -\frac{1}{2}$

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

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

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

$2y + 1 = 3x + 3$

$2y - 3x - 2 = 0$

Equation of the tangent

$m_1 m_2 = -1$

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

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

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

$6y + 4x + 3 + 4 = 0$

$6y + 4x + 7 = 0$

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

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

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

$\frac{dy}{dx} = 5$

$m = 5 \quad x_1 = -2, \quad y_1 = -5$

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

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$

Equation of ang tangent

$m_1 m_2 = -1$

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$

Equation of the normal

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

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

$\frac{dy}{dx}\Big|_3 = \frac{-1}{3^2} = \frac{-1}{9}$

$m = \frac{-1}{9} \quad x_1 = 3 \quad x_2 = \frac{1}{3}$

5

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

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

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

$9y - 3 = x + 3$

$9y + x - 6 = 0$

Equation of a tangent

$m_1 m_2 = -1$

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

$m_2 = 9$

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

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

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

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

$3y - 1 = 3(9x - 27)$

$3y - 1 = 27x - 81$

$3y - 27x + 80 = 0$

Equation of the normal