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

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

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

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

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

$6y + 4x + 7 = 0$

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

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

$\frac{dy}{dx}|_2 = 1 - 2(2)$

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

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

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

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

$y + 5 = -5x - 10$

$y + 5x + 5 = 0$

Equation of tangent

$m m_2 = -1$

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$

Equation of the normal

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

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

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

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

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

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$

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