

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

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

$$\left. \frac{dy}{dx} \right|_{x=-2} = 1 - 2(-2)$$

$$m = 1 + 4 = 5$$

eqn of tangent

$$y - y_1 = m_1(x - x_1)$$

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

$$y + 5 = 5x + 10$$

$$y = 5x + 5$$

eqn of normal

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

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

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

$$5y = -x - 2 - 25$$

$$5y = -x - 27$$

$$y = \frac{-1}{5}x - \frac{27}{5}$$

→

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

$$\frac{dy}{dx} \Big|_{x=1} = 4(1)^2 = 4$$

$$m_1 = 4$$

eqn. of tangent

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

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

$$y - 2 = 4x - 4$$

$$\therefore y = 4x - 4 + 2,$$

$$y = 4x - 2$$

eqn of normal,  $y - y_1 = \frac{-1}{m_1} (x - x_1)$

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

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

$$4y = -x + 9$$

$$y = \frac{-1}{4}x + \frac{9}{4}$$

$$5. \quad y = \frac{x^3}{2} \quad (-1, -\frac{1}{2})$$

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

eqn of tangent

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

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

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

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

eqn of normal

$$y - y_1 = \frac{-1}{m_1} (x - x_1)$$

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

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

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

$$3y = -x - 4\frac{1}{2}$$

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

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

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

$$= 6(2) - 2$$

$$m_1 = 12 - 2 = 10$$

eqn of tangent

$$y - y_1 = m_1(x - x_1)$$

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

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

$$y = 10x - 20 + 8, \quad y = \underline{10x - 12}$$

eqn of normal

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

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

$$10y - 80 = -x + 2, \quad 10y = -x + 2 + 80$$

$$10y = -x + 82$$

$$y = \frac{-1}{10}x + \frac{82}{10}$$

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

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

$$m_1 = -\frac{1}{9}$$

Eqn of tangent

$$y - y_1 = m_1(x - x_1)$$

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

$$9y - 3 = x - 3$$

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

$$9y = x, \quad y = \frac{1}{9}x$$

eqn of normal

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

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

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

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

$$y = -9x + 27 + \frac{1}{3}, \quad y = \underline{-9x + 27\frac{1}{3}}$$