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

Solution

$$y = 2x^2, \quad \frac{dy}{dx} = 4x$$

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

$\therefore m = 4$

$x_1 = 1, \quad y_1 = 2$

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$

$\therefore$ Equation for the tangent is $y - 4x + 2 = 0$.

For Equation of the normal, $m_1 m_2 = -1$

$$m_2 = \frac{-1}{m_1}$$

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

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

$4y - 8 = -x + 1$

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

$\therefore$ The Equation of the normal is $4y + x - 9 = 0$