

# Maths

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

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

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Gradient at  $x = -1$

$$\frac{3(-1)^2}{2}$$

$$m = \frac{3}{2}$$

Equation of tangent

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

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

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

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

$$2y + 1 = -3x + 1$$

$$2y + 3x = 0 \quad \text{--- Equation of tangent}$$

Equation of normal

$$-\frac{3}{2} \cdot m_2 = -1$$

$$m_2 = \frac{-1 \cdot 2}{-3}$$

$$m = \frac{2}{3}$$

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

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

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

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

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

$$2x - 3y - \frac{3}{2} = 0$$

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

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

find the gradient at  $x = -2$

$$m = 1 - 2(-2)$$

$$m = 1 + 4$$

$$m = 5$$

Equation of tangent

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

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

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

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

$$5x + 10 = y + 1$$

$$5x - y + 9 = 0$$

Equation of normal

$$m_1 \cdot m_2 = -1$$

$$5 \cdot m_2 = -1$$

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

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

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

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

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

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

$$5y + x + 7 = 0$$

Solve

①  $y = 2x^2$ , Point  $(1, 2)$   
 $\frac{dy}{dx} = 4x$

find the gradient at  $x=1$   
 $\frac{dy}{dx} \Big|_{x=1} = 4(1) = 4$   
 $m = 4$   
 $x_1 = 1, y_1 = 2$

Equation of tangent  
 $y - y_1 = m(x - x_1)$   
 $y - 2 = 4(x - 1)$   
 $y - 2 = 4x - 4$   
 $y = 4x - 2$

Equation of normal  
 $m_1 m_2 = -1$   
 $4 \cdot m_2 = -1$   
 $m_2 = -\frac{1}{4}$

Equation of normal  
 $y - y_1 = m_2(x - x_1)$   
 $y - 2 = -\frac{1}{4}(x - 1)$   
 $y - 2 = -\frac{x - 1}{4}$   
 $4y - 8 = -x + 1$   
 $4y + x - 7 = 0$

Equation of the normal  
 $4y + x - 7 = 0$

②  $y = 3x^2 - 2x$  find gradient at  $(2, 8)$   
 $\frac{dy}{dx} = 6x - 2$

find gradient at  $x=2$   
 $\frac{dy}{dx} \Big|_{x=2} = 6(2) - 2 = 10$   
 $m = 10$

Equation of tangent  
 $y - y_1 = m(x - x_1)$   
 $y - 8 = 10(x - 2)$   
 $y - 8 = 10x - 20$   
 $y = 10x - 12$

Equation of normal  
 $m_1 m_2 = -1$   
 $10 \cdot m_2 = -1$   
 $m_2 = -\frac{1}{10}$

Equation of normal  
 $y - 8 = -\frac{1}{10}(x - 2)$   
 $y - 8 = \frac{-x + 2}{10}$   
 $10y - 80 = -x + 2$   
 $10y + x - 78 = 0$  -- Equation of normal