

Kpologiri Precious Ejeomafunwa

19/MTH501/231

MBS

MAT 101

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

Soln

$$Y = 2x^2 \quad x_1 = 1 \quad y_1 = 2$$

$$dy/dx = 4x$$

$$dy/dx = 4(1)$$

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

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

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

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

$$y - 4x + 2 = 0 \leftarrow \text{Equation of tangent}$$

$$M_1 M_2 = -1$$

$$M_2 = \frac{-1}{M_1} = M_2 = -\frac{1}{4} \quad M_2 = -1/4$$

$$y - y_1 = m_2(x - x_1)$$

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

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

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

$$4y + x - 9 = 0 \text{ which gives the equation of the tangent}$$

2. $Y = 3x^2 - 2x$ at the point $(2, 8)$

Soln

$$Y = 3x^2 - 2x \quad x_1 = 2 \quad y_1 = 8$$

$$dy/dx = 6x - 2$$

$$dy/dx |_{x=2} = 6(2) - 2$$

$$M = 10$$

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

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

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

$$y - 10x - 8 + 20 = 0$$

$$y - 10x + 12 = 0$$

which gives the equation of the normal

$$M_2 = -\frac{1}{M_1} \quad M_2 = -\frac{1}{10}$$

$$y - y_1 = M_2(x - x_1)$$

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

$$10y - 80 = -x + 2$$

$$10y - 80 + x - 2 = 0$$

$10y + x - 82 = 0$ which gives the eqn of the tangent.

3 $y = x^3/2$ at the point $(-1, -1/2)$

Soln

$$y = x^3/2 \quad x_1 = -1 \quad y_1 = -1/2$$

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

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

$$M = 3$$

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

$$y - (-1/2) = 3(x - (-1))$$

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

$$y - 3x + 1/2 - 3 = 0$$

$y - 3x - 5/2 = 0$ which gives the equation of the normal

$$M_2 = -1/M_1 \quad M_2 = -1/3$$

$$y - y_1 = M_2(x - x_1)$$

$$y - (-1/2) = -1/3(x - (-1))$$

$$y + 1/2 = -1/3(x + 1)$$

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

$$3y + x + 3/2 + 1 = 0$$

$3y + x + 5/2 = 0$ which gives the equation of the tangent

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

Soln

$$Y = 1 + x - x^2$$

$$x_1 = -2, y_1 = -5$$

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

$$\frac{dy}{dx} = 1 - 2(-2) = 1 - 2(-2) \quad \frac{dy}{dx} = 14$$

$$M = 5$$

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

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

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

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

$$y + 5 - 10 - 5x = 0$$

$y - 5x - 5 = 0$ which gives the equation of the normal

$$M_2 = -\frac{1}{M_1} = M_2 = -\frac{1}{5}$$

$$y - y_1 = M_2(x - x_1)$$

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

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

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

$$5y + x + 25 + 2 = 0$$

$5y + x + 27 = 0$ which gives the equation of the tangent.

5 $Y = 1/x$ at the point $(3, 1/3)$.

Soln

$$Y = 1/x \quad x_1 = 3 \quad y_1 = 1/3$$

$$y = x^{-1}$$

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

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

$$M = -1/9$$

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

$$y - 1/3 = M(x - 3) \Rightarrow y - 1/3 = -1/9(x - 3)$$

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

$$y - 3 + x - 3 = 0$$

which gives the equation of the normal

$$m_2 = -1/m_1 \quad m_1 = -1/4 \quad m_2 = 4$$

$$y - y_1 = m_2(x - x_1)$$

$$y - 1/3 = 4(x - 3)$$

$$y - 1/3 = 4x - 12$$

$$y - 4x + 12 - 1/3 = 0$$

$$y - 4x + 35/3 = 0 \text{ which gives the equation}$$

of the tangent