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MATRIC NO: 19/MHS01/121

COURSE: MAT 104

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

$$\frac{dy}{dx} = 4x$$

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

Equation of tangent,

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

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

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

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

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

Equation of normal =

$$m_2 = \frac{-1}{m_1} = \frac{-1}{4} = -\frac{1}{4}$$

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

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

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

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

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

$$4y + x - 9 = 0$$

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

$$\frac{dy}{dx} = 6x - 2$$

$$m = \frac{dy}{dx} \Big|_{x=2} = 6(2) - 2 = 12 - 2 = 10$$

Equation of tangent,

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

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

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

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

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

Equation of normal,

$$m_2 = -\frac{1}{m_1} = -\frac{1}{10}$$

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

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

$$10(y-8) = -1(x-2)$$

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

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

$$10y + x - 82 = 0$$

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

$$\frac{dy}{dx} = \frac{V \frac{dV}{dx} - U \frac{dU}{dx}}{V^2} = \frac{2(3x^2) - x^3(0)}{2^2}$$

$$\frac{dy}{dx} = \frac{6x^2}{4} = \frac{3x^2}{2}$$

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

Equation of the tangent =

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

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

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

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

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

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

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

$$m = \frac{dy}{dx} \Big|_{x=-2} = 1 - 2(-2) = 5$$

Equation of the tangent =

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

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

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

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

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

$$y - 5x - 5 = 0$$

Equation of the normal =

$$m_2 = \frac{-1}{m_1} = \frac{-1}{5}$$

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

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

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

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

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

$$4y + 2 = 6x + 6$$

$$4y - 6x + 2 - 6 = 0$$

$$4y - 6x - 4 = 0$$

$$2y - 3x - 2 = 0$$

Equation of the normal =

$$m_2 = \frac{-1}{m_1} = -1 \div \frac{3}{2} = -1 \times \frac{2}{3} = -\frac{2}{3}$$

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

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

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

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

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

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

$$~~6y + 4x + 3 + 4 = 0~~ \quad 6y + 4x + 3 + 4 = 0$$

$$6y + 4x + 7 = 0$$

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

$$5y + x + 27 = 0$$

5 $y = \frac{1}{x}$ at the point $(3, \frac{1}{3})$

~~$$\frac{dy}{dx} = \frac{V \frac{dy}{dx} + U \frac{dv}{dx}}{V^2} \quad (U \frac{dv}{dx} \equiv x(0) - 0(1))$$~~

~~$$\frac{dy}{dx} =$$~~

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

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

$$m = \frac{dy}{dx} \Big|_{x=3} = -\frac{1}{x^2} = -\frac{1}{(3)^2} = -\frac{1}{9}$$

Equation of the tangent, =

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

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

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

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

$$9(3y-1) = 3(-x+3)$$

$$27y-9 = -3x+9$$

$$27y+3x-9-9=0$$

$$27y+3x-18=0$$

$$9y+x-6=0$$

Equation of the normal, z

$$m_2 = -\frac{1}{m_1} = -1 \div \frac{-1}{9} = -1 \times \frac{9}{-1} = 9$$

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

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

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

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

$$3y-1 = 3(9x-27)$$

$$3y-1 = 27x-81$$

$$3y-27x-1+81=0$$

$$3y-27x+80=0$$