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MHS = 19/MHSC/017
MBBS
MATH 104.

1
 $y = 2x^2$ (1, 2)

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

$$\Rightarrow m = 4(1) = 4$$

Equation of tangent $\Rightarrow y - y_1 = m(x - x_1)$

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

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

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

Equation of normal $\Rightarrow y - y_1 = \frac{-1}{m}(x - x_1)$

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

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

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

$$4y + x - 9 = 0 // \text{ (Equation of normal)}$$

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

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

$$m = 6(2) - 2 = 10$$

Equation of tangent $\Rightarrow y - y_1 = m(x - x_1)$

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

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

$$y - 10x + 12 = 0 // \text{ [Equation of tangent]}$$

Equation of normal $\Rightarrow y - y_1 = \frac{-1}{m}(x - x_1)$

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

$$\Rightarrow 10(y - 8) = -x + 2$$

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

$$\Rightarrow 10y + x - 82 = 0 \quad [\text{Equation of normal}]$$

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

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

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

$$\text{Equation of tangent} \Rightarrow y - y_1 = m(x - x_1)$$

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

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

Multiply both sides by 2

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

$$2y - 3x - 2 = 0 \quad [\text{Eqn of tangent}]$$

$$\text{Eqn of normal} \Rightarrow y - y_1 = \frac{-1}{m}(x - x_1)$$

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

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

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

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

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

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

$$6y+4x+7 = 0 \quad [\text{Eqn of normal}]$$

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

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

$$m = 1 - 2(-2) = 1 - (-4) = 5$$

$$\text{Eqn of gradient} \Rightarrow y - y_1 = m(x - x_1)$$

tangent

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

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

$$y-5x-5=0 \quad \text{// (Eqn of tangent)}$$

$$\text{Eqn of normal} \Rightarrow y-y_1 = \frac{-1}{m} (x-x_1)$$

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

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

$$5y+x+27=0 \quad \text{// (Eqn of normal)}$$

$$5 \quad y = 1/x \quad (3, 1/3)$$

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

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

$$m = \cancel{1/3}^{-1/3^2} = -1/9$$

$$\text{Eqn of tangent} \Rightarrow y - y_1 = m(x - x_1)$$

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

Multiply both sides by 3

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

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

$$9y + x - 6 = 0 \quad (\text{Eqn of tangent})$$

$$\text{Eqn of normal} \Rightarrow y - y_1 = \frac{-1}{m}(x - x_1)$$

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

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

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

$$3y - 1 = +27x - 81 \Rightarrow 3y - 1 = 27x - 81$$

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

$$\Rightarrow 3y - 27x + 80 = 0 \quad (\text{Eqn of normal})$$