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MAT 104

① $y = 2x^2$ at point (1, 2)

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

② Equation of the tangent of the curve

$$y - y_1 = m(x - x_1)$$
$$y - 2 = 4(x - 1)$$
$$y - 2 = 4x - 4$$
$$4x - y - 12 = 0$$

Equation of tangent $\rightarrow \therefore 4x - y - 2 = 0$

③ Equation of the normal to the curve

$$y - y_1 = \frac{1}{m}(x - x_1)$$
$$y - 2 = \frac{1}{4}(x - 1)$$
$$4y - 8 = -1(x - 1)$$
$$4y - 8 = -x + 1$$
$$x + 4y - 9 = 0$$

Equation of normal $\rightarrow \therefore x + 4y - 9 = 0$

④ $y = 3x^2 - 2x$ at point (2, 8)

$$y = 3x^2 - 2x$$
$$\frac{dy}{dx} = 6x - 2$$
$$= 6(2) - 2 = 12 - 2$$
$$m = 10$$

⑤ Equation of tangent of the curve

$$y - y_1 = m(x - x_1)$$
$$y - 8 = 10(x - 2)$$
$$y - 8 = 10x - 20$$
$$y - 10x + 8 + 20 = 0$$

Equation of tangent $\rightarrow \therefore y - 10x + 28 = 0$

⑥ Equation of normal to the curve

$$y - y_1 = \frac{1}{m}(x - x_1)$$
$$y - 8 = \frac{1}{10}(x - 2)$$
$$10y - 80 = -1(x - 2)$$
$$10y - 80 = -x + 2$$

$$\text{Equation of normal } \rightarrow \therefore x + 10y - 82 = 0$$

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

$$y = \frac{x^2}{2}$$

$$\frac{dy}{dx} = 8x$$

$$m = 8$$

(a) Equation of the tangent of curve $= y - y_1 = m(x - x_1)$

$$y - (-1/2) = 8(x + 1)$$

$$2y + 1 = 16(x + 1)$$

$$2y + 1 = 16x + 16$$

$$16x - 2y + 15 = 0$$

Equation of normal $\rightarrow 16x - 2y + 15 = 0$

(b) Equation of normal of curve $= y - y_1 = -1/m(x - x_1)$

$$y - (-1/2) = -1/8(x + 1)$$

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

$$x + 8y + 5 = 0$$

Equation of normal $\rightarrow \therefore x + 8y + 5 = 0$

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

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

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

where $x = 2$

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

$$m = -3$$

$$\therefore m = -3$$

(a) Equation of tangent of a curve $= y - y_1 = m(x - x_1)$

$$y - (-5) = -3(x + 2)$$

$$y + 5 = -3x - 6$$

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

Equation of tangent $\Rightarrow 5x - y + 5 = 0$

Equation of normal of a curve

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

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

$$5y + 25 = -1(x + 2)$$

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

Equation of normal $\Rightarrow 2x + 5y + 27 = 0$

6) $y = 1/x$ and point $(3, 1/3)$

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

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

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

where $x = 3$

$$m = -(3)^{-2}$$

$$= -\frac{1}{3^2}$$

$$m = -\frac{1}{9}$$

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

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

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

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

Equation of tangent $\Rightarrow x + 9y - 6 = 0$

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

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

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

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

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

Equation of normal $\Rightarrow x - 9y = 0$