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Computer Engineering
MATHS 104

ii $y = t^3 - \frac{t^2}{2} - 2t + 4$

$$\frac{dy}{dt} = 3t^2 - \frac{2t}{2} - 2$$

at S.P. $\frac{dy}{dt} = 0$

$$3t^2 - t - 2 = 0$$

$$3t^2 - 3t + 2 - 2$$

$$3t(t-3) + 2(t-0)$$

$$3t + 2 = 0, t - 1 = 0$$

$$t = -\frac{2}{3}, t = 1$$

10 coordinate of SP

at $t = -\frac{2}{3}$

$$y = \left(-\frac{2}{3}\right)^3 - \frac{\left(-\frac{2}{3}\right)^2}{2} - 2\left(-\frac{2}{3}\right) + 4$$

$$y = \frac{88}{27} \text{ or } 3.25$$

when $t = 1$

$$y = (1)^3 - \frac{(1)^2}{2} - 2(1) + 4$$

$$y = \frac{5}{2}$$

coordinate of SP $\left(-\frac{2}{3}, \frac{88}{27}\right)$ or $\left(1, \frac{5}{2}\right)$

ii nature of SP

$$d^2y/dx^2 = 6t - 1$$

at $t = -\frac{2}{3}$

$$= 6\left(-\frac{2}{3}\right) - 1$$

$$\left(-\frac{12}{3}\right) - 1$$

$$= -5$$

$$\frac{d^2y}{dx^2} = 5$$

$$\text{at } x = 1$$

$$\frac{d^2y}{dx^2} \bigg|_{x=1} = 5(1) - 1$$

$$= 5 - 1$$

$$= 4$$

at $(1, 5/2)$ there is minimum point

$$2y^2 - 5x^4 - 2 - 7y^3 = 0$$

$$\frac{d}{dx}(2y^2) - \frac{d}{dx}(5x^4) - \frac{d}{dx}(2) - \frac{d}{dx}(7y^3) = 0$$

$$4y^3 \frac{dy}{dx} - 20x^3 - 0 - 21y^2 \frac{dy}{dx} = 0$$

$$4y^3 \frac{dy}{dx} - 21y^2 \frac{dy}{dx} = 20x^3$$

$$\frac{dy}{dx} = \frac{20x^3}{4y^3 - 21y^2}$$

$$3 \quad 4x^2 + 2xy^3 - 5y^2 = 0$$

$$\frac{d}{dx}(4x^2) + \frac{d}{dx}(2xy^3) - \frac{d}{dx}(5y^2) = 0$$

$$8x + 2y^3 + 2x(3y^2) \frac{dy}{dx} - 10y \frac{dy}{dx} = 0$$

$$2x(3y^2) \frac{dy}{dx} - 10y \frac{dy}{dx} = 8x - 2y^3$$

$$\frac{dy}{dx} = \frac{8x - 2y^3}{2x(3y^2) - 10y}$$

$\frac{dy}{dx}$ when $x = 1$ and $y = 2$

$$\frac{dy}{dx} = \frac{8(1) - 2(2)^3}{2(1)(3)(2)^2 - 10(2)} = \frac{24}{26} = \frac{6}{7}$$