

Aina Oluwagbolahan Emmanuel

19/ENAO4/002

Electrical/Electronics

Serial Number: 06

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

$$\frac{dy}{dt} = 3t^2 - t - 2 = 0$$

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

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

$$3t(t-1) + 2(t-1) = 0$$

$$(3t+2)(t-1) = 0$$

$$t = -\frac{2}{3} \text{ or } t = 1$$

ii) Coordinate of the stationary point
at $t = -\frac{2}{3}$

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

$$= -0.2963 - 0.2222 + 1.3333 + 4$$

$$y = 4.81$$

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

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

$$= 1 - \frac{1}{2} - 2 + 4$$

$$y = 2.5$$

$$\left(-\frac{2}{3}, 4.81\right)$$

$$(1, 2.5)$$

Nature of the stationary point

$$\frac{d^2y}{dt^2} = 6t - 1$$

$$\text{at } t = -2/3$$

$$\frac{d^2y}{dt^2} = 6(-2/3) - 1$$

$$= -4 - 1$$

$= -5$ we have a maximum point

$$\text{At } t = 1$$

$$\frac{d^2y}{dt^2} = 6(1) - 1 = 5$$

we have a minimum point

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

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

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

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

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

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

F_1

t_2

$$2y^2 = 5x^2$$

3)

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

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

$$8x + (2y^3 + 6xy^2 \frac{dy}{dx}) - 10y \frac{dy}{dx} = 0$$

$$8x + 2y^3 + 6xy^2 \frac{dy}{dx} - 10y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} (6xy^2 - 10y) + 8x + 2y^3 = 0$$

$$\frac{dy}{dx} = \frac{-8x - 2y^3}{6xy^2 - 10y}$$

$$\frac{dy}{dx} = \frac{-4x - 2y^3}{3xy^2 - 5y}$$

when $x=1$

$$\frac{dy}{dx} = \frac{-4x - 2y^3}{3xy^2 - 5y}$$

$$\frac{dy}{dx} = \frac{-8x - 2y^3}{6xy^2 - 10y}$$

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

$$\frac{dy}{dx} = \frac{4x + y^3}{5y - 3y^2}$$

$$\frac{dy}{dx} = \frac{4(1) + (2)^3}{5(2) - 3(2)^2}$$

$$= \frac{4 + 8}{10 - 12} = \frac{12}{-2}$$

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