

OBO Emmanuel

18/ENG 02/065

Computer Eng

Mat 104

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

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

At stationary point,  $\frac{dy}{dt} = 0$

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

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

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{2 \pm \sqrt{4 + 24}}{6}$$

$$t = \frac{2 \pm \sqrt{28}}{6}$$

$$t = \frac{2 + 5.29}{6}$$

$$t = \frac{2 + 5.29}{6} \text{ or } t = \frac{2 - 5.29}{6}$$

$$t = \frac{7.29}{6} \quad t = \frac{-3.29}{6}$$

$$t = 1.22 \quad t = -0.55$$

ii)

When  $t = 1.22$

$$y = (1.22)^3 - \frac{(1.22)^2}{2} - 2(1.22) + 4$$

$$y = 1.82 - 0.74 - 2.44 + 4$$

$$y = 2.64$$

When  $t = 0.55$

$$y = (-0.55)^3 - \frac{(0.55)^2}{2} - 2(0.55) + 4$$

$$y = 0.17 - 0.15 + 1.1 + 4$$

$$y = 4.78$$

iii) The coordinate are  $(1.22, 2.64)$  and  $(-0.55, 4.78)$

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

When  $t = 1.22$

$$\begin{aligned} \frac{d^2t}{dt^2} &= 6(1.22) - 2 \\ &= 7.32 - 2 = 5.32 \end{aligned}$$

At  $(1.22, 2.64)$  we have a minimum point

When  $t = -0.55$

$$\begin{aligned} \frac{d^2t}{dt^2} &= 6t - 2 \\ \text{when } t &= -0.55 \\ \frac{d^2t}{dt^2} &= 6(-0.55) - 2 \\ &= -3.3 - 2 = -5.3 \end{aligned}$$

At  $(-0.55, 4.78)$  we have the maximum point

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

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

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

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

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

$$8x + 2y^3 + 3y^2 - 5y^2 \left( \frac{dy}{dx} \right) 2x - 10y \left( \frac{dy}{dx} \right) = 0$$

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

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

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

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

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

ii) When  $x = 1$

$$\begin{aligned} \frac{dy}{dx} &= \frac{-4(1) - y^2}{3(1)y^2 - 5y} \\ &= \frac{-4 - y^2}{3y^2 - 5y} \end{aligned}$$

When  $y = 2$

$$\begin{aligned} \frac{dy}{dx} &= \frac{-4x \cdot (2)^2}{3x(2)^2 - 5(2)} \\ &= \frac{-4x \cdot 8}{12x - 10} \\ &= \frac{2(-2x - 4)}{2(6x - 5)} \\ &= \frac{-2x - 4}{6x - 5} \end{aligned}$$