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100L

MAT104 Assignment

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

at station any point, $dy/dx = 0$, $3t^2 - t - 2 = 0$

Using quadratic formular $t = 1$ or $-2/3$

$$\text{at } t = 1, y = 3(1)^2 - 1 - 2 = 0 \quad \text{At } t = -2/3, y = 3\left(\frac{-2}{3}\right)^2 - \frac{-2}{3} - 2 = \frac{2}{3} - 2$$

∴ the stationary point co-ordinates are $(1, 0)$ and $(-2/3, 0)$

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

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

$$\text{at } t = -2/3 \quad \frac{d^2y}{dt^2} = 6\left(\frac{-2}{3}\right) - 1 = -5$$

$\frac{d^2y}{dt^2} > 0$: we have a minimum point

$\frac{d^2y}{dt^2} < 0$: ∴ we have a maximum point

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

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

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

$$\frac{dy}{dx} = \frac{20x^3}{40y - 21y^2}$$

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

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

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

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

$$\text{at } x=1, y=2, \quad \frac{dy}{dx} = \frac{4(1) + (2)^3}{-3(1)(2)^2 + 5(2)} = \frac{4+8}{-3(4)+10}$$

$$= \frac{12}{-12+10} \Rightarrow \frac{12}{-2} = \underline{\underline{-6}}$$