

PINNICK ITSE ORITSETSERUNDEDE

CHEMICAL ENGINEERING

19/ENG01/013

Serial Number: 48

MAT 104 Assignment

Question 1

Determine the stationary point, coordinate of the stationary point and nature of the stationary point of the curve $y = t^3 - \frac{t^2}{2} - 2t + 4$.

Solution

i Stationary point $\Rightarrow \frac{dy}{dt} = 0$

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

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

Stationary points are $t = 1$ and $t = -\frac{2}{3}$

ii Co ordinates of stationary point

Where $t = 1$

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

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

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

$$y = 2.5$$

Where $t = -\frac{2}{3} = -0.67$

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

$$y = \frac{-8}{27} - \frac{2}{9} + \frac{4}{3} + 4$$

$$y = \frac{130}{27} = 4.8$$

∴ Coordinates of stationary points are $(1, 2.5)$ and $(-2/3, 4.8)$

Question 2

If $2y^2 - 5x^4 - 2 - 7y^3 = 0$ find dy/dx

Solution

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

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

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

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

Question 3

Find dy/dx if $4x^2 + 2xy^3 - 5y^2 = 0$ and evaluate dy/dx when $x = 1$ and $y = 2$

Solution

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

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

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

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

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

$$ii \quad \frac{dy}{dx} \Big|_{xz=1 \ \& \ y=2} = \frac{-8(1) - 2}{6(1)(2)^2 - 10(2)}$$

$$= \frac{-8 - 2}{24 - 20} = \frac{-10}{4} = -\frac{5}{2}$$

$$\therefore \frac{dy}{dx} \Big|_{xz=1 \ \& \ y=2} = -2.5$$