Name: Ohwuchi Avitus Chukwuebuka
Department: Chemical Engineering
Matric No: 19/ENG01/010

MAT 104

1 Determine the stationary point, coordinate of the stationary point and nature of the stationary point of the curve

$$y = t^3 - t^2/2 - 2t + 4$$

Sol

$dy/dx = 3t^2 - t - 2$

At stationary point, $dy/dx = 0$

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

$t = 1, \ t = -2/3$

(ii) Coordinates of stationary point

At $t = 1$

$y = (1)^3 - (1)^2/2 - 2(1) + 4$

$= 2.5$

At $t = -2/3$

$y = (-2/3)^3 - (-2/3)^2/2 - 2(-2/3) + 4$

$= 4.8$

$\therefore$ Coordinate; $(1, 2.5)$

$(\frac{-2}{3}, 4.8)$

(iii) Nature: $d^2y/dx^2 = 6t - 1$

At $t = 1$

$6(1) - 1$

$= 5$

$\therefore$ It is at minimum point

At $t = -2/3$

$6(-2/3) - 1$

$= -5$

$\therefore$ It is at maximum point

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

$4y\,dy/dx - 20x^3 - 21y^2\,dy/dx = 0$

$4y\,dy/dx - 21y\,dy/dx = 20x^3$

$dy/dx(4y - 21y) = 20x^3$

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

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

$8x + 2y^3 + 6xy^2\, dy/dx - 10y\, dy/dx = 0$

$6xy^2\, dy/dx - 10y\, dy/dx = -8x - 2y^3$

$dy/dx\,(6xy^2 - 10y) = -(8x + 2y^3)$

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

When $x = 1,\ y = 2$

$$dy/dx = \frac{-(8(1) + 2(2)^3)}{6(1)(2)^2 - 10(2)}$$

$$= \frac{-(8 + 16)}{24 - 20}$$

$$= \frac{-24}{4}$$

$dy/dx = \underline{\underline{6}}$