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1/ENG04/051

MATH 104

200 LEVEL

ELECT/ELECT.

1. Determine the stationary point, coordinate of the stationary point and nature of the stationary point of the curve. $y = t^3 - t^2/2 - 2t + 4$.

Soln

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

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

At stationary point $\frac{dy}{dx} = 0$

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

Solving by formula method.

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

$a = 3, \; b = -1, \; c = -2$

$t = \frac{+1 \pm \sqrt{(-1)^2 - 4(3)(-2)}}{2(3)} = \frac{1 \pm \sqrt{1 + 24}}{6}$

$= \frac{1 \pm \sqrt{25}}{6} = 1/6 \pm 5/6$

$t_1 = 1/6 + 5/6 = 7/6 = 1.167$

$t_2 = 1/6 - 5/6 = -4/6 = -0.667$

the nature of stationary points.

At $t_1 = 1.167$; $\frac{d^2y}{dt^2} = 6t - 1 = 6(1.167) - 1$

$= 7.002 - 1 = 6.002$

$\frac{d^2y}{dt^2} = 6.002$; minimum point

At $t_2 = 0.667$, $d^2y/dt^2 = 6t - 1 = 6(0.667) - 1$

$= -4.002$

$d^2y/dt^2 = -5.004$, maximum point

Q. If $2y^2 - 5x^4 - 2 - 4y^2 = 0$, find dy/dx

Implicit function.

Collect like terms.

$2y^2 - 4y^2 = 5x^4 + 2$

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

$(4y - 4y) \, dy/dx = 20x^2$

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

$\frac{dy}{dx} = \frac{20x^3}{-10y}$.

Pg 2.

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

$4 \cdot 2x + 2x \, 3y^2 \, dy/dx + 2y^3 \cdot 5 \cdot 2y \, dy/dx = 0$.

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

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

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

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

at $x = 1, y = 2$

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

$= \frac{8 + 16}{20 - 12} = \frac{24}{8}$

$dy/dx = 3$.