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17/ENG04/004
Elect/Elect Engineering
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MAT 104

1)
$y = t^3 - t^2/2 - 2t + 4$
$dy/dt = 3t^2 - t - 2$

(i) For stationary point
$3t^2 - t - 2 = 0$
$3t^2 - 3t + 2t - 2 = 0$
$3t(t-1) + 2(t-1) = 0$
$(3t+2)(t-1) = 0$
$3t + 2 = 0$ or $t - 1 = 0$
$t = -2/3$ or $t = 1$

(ii) For coordinate of the stationary point
At $t_1 = -2/3 = -0.67$
$y = (0.67)^3 - \frac{(0.67)^2}{2} - 2(0.67) + 4$
$y = (-0.30) - 0.22 + 1.34 + 4$
$y_1 = 4.824$
$y_1 \simeq 4.8$

At $t_2 = 1$
$y = (1)^3 - \frac{(1)^2}{2} - 2(1) + 4$
$y = 1 - 1/2 - 2 + 4$

$y_2 = 2.5$

$\therefore$ Coordinates are $(t_1, y_1) = (-0.67, 4.82)$

$(t_2, y_2) = (1, 2.5)$

(iii) For the nature of the stationary point

$dy/dt = 3t^2 - t' - 2$

$d^2y/dt^2 = 6t - 1$

$t = -0.67$, $d^2y/dt^2 = 6(-0.67) - 1 = -5.02$

$t = 1$, $d^2y/dt^2 = 6(1) - 1 = 5$

$\therefore$ The max point and min point are 5 and -5.02 respectively.

2) $2y^2 - 5x^4 - 2 - 7y^3 = 0$. $dy/dx = ?$

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

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

$dy/dx(4y - 21y^2) = 20x^3$

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

3.) $dy/dx = ?$

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

$$d(4x^2)/dx + 2d[y^3x]/dx - d(5y^2)/dx = 0$$

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

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

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

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

When $x = 1$ and $y = 2$

$$dy/dx = \frac{-(8(1) + 2(2)^3)}{6(1)(2)^2 - 10(2)} = \frac{-(8 + 16)}{24 - 20}$$

$$\frac{dy}{dx} = \frac{-24}{4} = -6$$