(86)

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Math 102

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

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

At stationary point $dy/dt = 0$

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

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

$t = \frac{2 \pm \sqrt{4 + 24}}{6}$

$t = \frac{2 \pm \sqrt{28}}{6}$

$t = \frac{2 + 5.29}{6}$

$t = \frac{2 + 5.29}{6}$ or $\frac{2 - 5.29}{6}$.

$t = \frac{7.29}{6}$ or $\frac{-3.29}{6}$.

$t = 1.22$ $t = -0.55$

(i) when $t = 1.22$

$y = (1.22)^3 - (1.22)^2/2 - 2(1.22) + 4$

$y = 1.82 - 0.74 - 2.44 + 4$

$y = 2.64$

when $t = -0.55$

$y = (-0.55)^3 - \frac{(-0.55)^2}{2} - 2(-0.55) + 4$

$y = -0.17 - 0.15 + 1.1 + 4$

$y = 4.78$

∴ Coordinates $= (1.22, 2.64)$ or $(-0.55, 4.78)$

(ii) d^2y/dt^2 of $(3t^2 - 2t - 2) = 6t - 2$.

when $t = 1.22$

$d^2y/dt^2 = 6(1.22) - 2$.

$7.32 - 2$

$= 5.32$.

∴ At $(1.22, 2.64)$ we have a minimum point

when $t = -0.55$

$\frac{d^2y}{dt^2} = 6(-0.55) - 2$

$= -3.3 - 2$

$=$

(2) $2y^2 - 5x^4 - 8 - 7y^3 = 0$.

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

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

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

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

$8x + 2y^3 + 3y^2(dy/dx)2x - 10y(dy/dx) = 0$.

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

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

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

(i) $dy/dx = \frac{-4x - y^3}{3xy^2 - 5y}$. when $x = 1$ $\frac{dy}{dx} = \frac{-4(1) - y^3}{3(1)y^2 - 5y}$

$= \frac{-4 - y^3}{3y^2 - 5y}$.

(ii) when $y = 2$

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

$= \frac{-4x - 8}{12x - 10}$

$= \frac{2(-2x - 4)}{2(6x - 5)} = \frac{-2x - 4}{6x - 5}$