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**Question**

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

                     y = t3- t2/2 - 2t + 4

2. If 2y2- 5x4- 2 - 7y3= 0, find dy/dx

3. Find dy/dx if 4x2+2xy3-5y2=0  and evaluate dy/dx when x=1 and y=2.

**Solution**

**(1)**

                     y = t3- t2/2 - 2t + 4

$\frac{dy}{dx}$ = t2 - t -2

$∴$ The stationary point is $\frac{dy}{dx}$ = t2 - t -2

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

 3t2 – t – 2 = 0

3t2 –3t + 2t – 2 = 0

3t(t-1) +2(t-1) = 0

(3t + 2) (t – 1) = 0

3t = 2 or t = 1

t = $\frac{2}{3}$ or t = 1

ymax = ($\frac{-2}{3})$3 – $\frac{(\frac{-2}{3})^{2}}{2}$ -2(-$ \frac{2}{3})$ + 4

y= $\frac{-8}{27}$ - $\frac{4}{9}×\frac{1}{2}$ + $\frac{4}{3}$ + 4

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

y = $\frac{130}{27}$ coordinates are (t,y)

 = (-$\frac{2}{3},\frac{130}{27}$)

$\frac{d^{2}y}{dx^{2}}$ = 6t – 1

At t = - $\frac{2}{3}$ $\left|\frac{d^{2}y}{dx^{2}}\right.=6\left(\frac{-2}{3}\right)-1$

 = -4-1 = -5

It is a maxima

Also, At t = 1 $\left|\frac{d^{2}y}{dx^{2}}\right.=6\left(1\right)-1$

 = 6-1

 = 5

It is a maxima

ymin = 13 - $\frac{1^{2}}{2}$ – 2(1) + 4
 = 1 - $\frac{1}{2}$ -2 +4

ymin = 3 - $\frac{1}{2}$

 = $\frac{6-1}{2}$

 = $\frac{5}{2}$

Coordinates (t2, y2) = (1, $\frac{5}{2}$)

**(2)**

If 2y2- 5x4- 2 - 7y3= 0

4y$\frac{dy}{dx}$ -20x3 – 21y2$\frac{dy}{dx}$ = 0

4y$\frac{dy}{dx}$ -21y2$\frac{dy}{dx}$ = 20x3

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

**(3)**

4x2 + 2xy3 – 5y2 = 0

8x + 2y3 + 6xy2$\frac{dy}{dx}$ – 10y$\frac{dy}{dx}$ = 0

6xy2$\frac{dy}{dx}$ – 10y$\frac{dy}{dx}$ = -8x – 2y3

$\frac{dy}{dx}$(6xy2 – 10y) = -8 -2y3

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

At x = 1, y =2;

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

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