8 am (1) $x^3 - 3x^2 - 9x + 12$.

9 am Find the maximum & minimum values.

10 am

Ans! - $f(x) = x^3 - 3x^2 - 9x + 12$

11 am

12 noon $\therefore x^3 - 3x^2 - 9x + 12$

1 pm ~~$f(x) = 3x^2 - 6x$~~

2 pm $f'(x) = 3x^2 - 6x - 9 = 0$.

3 pm $\Rightarrow x^2 - 2x - 3 = 0$

4 pm $\Rightarrow x^2 + x - 3x - 3 = 0$

5 pm $\Rightarrow (x+1)(x-3) = 0$

6 pm $\therefore x = 3$

Eve. $x = -1$

IMPORTANT NOTES

$\therefore f'(x) = x^2 - 2x - 3$

8 am

$f''(x) = 2x - 2$

9 am

~~$\Rightarrow 2x - 2$~~

10 am

Substituting $x = 3$,

11 am

$\Rightarrow 2(3) - 2$

12 noon

$\Rightarrow 6 - 2$

1 pm

$\Rightarrow 4$.

2 pm

$f''(x) > 0$

3 pm

$x = 4$ is minima.

4 pm

5 pm

$f''(x) = 2x - 2$

6 pm

substituting $x = -1$

Eve.

$\Rightarrow 2(-1) - 2$

$\Rightarrow -2 - 2$

IMPORTANT NOTES

$\Rightarrow -4$

$f''(x) < 0 \therefore x = -1$ is maxima

8 am (2) Calculate the slope.

9 am $(-1, -1)$, $(3, 8)$

10 am Slope $= m = \dfrac{y_2 - y_1}{x_2 - x_1}$

11 am

12 noon $= \dfrac{8 - (-1)}{3 - (-1)}$

1 pm

2 pm $= \dfrac{8+1}{3+1} = \dfrac{9}{4}$.

3 pm

4 pm $m = \dfrac{9}{4}$

5 pm

6 pm

Eve.

IMPORTANT NOTES

(3) Solve $w'(z)$.

$$w(z) = \frac{4z-5}{2-z}$$

8 am

9 am

10 am

Quotient Rule.

11 am

12 noon

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

1 pm

2 pm

$$= \frac{(2-z)\frac{d}{dz}(4z-5) - (4z-5)\frac{d}{dz}(2-z)}{(2-z)^2}$$

$$= \frac{(2-z)(4) - (4z-5)(-1)}{(2-z)^2}$$

$$= \frac{8 - 4z + 4z - 5}{(2-z)^2} = \frac{3}{(2-z)^2}$$

IMPORTANT NOTES

$$w'z = \frac{3}{(2-z)^2} = \frac{3}{z^2+4-4z}$$

(3) $f(x) = 2x^3 + 6x^2 + 3x$.

Find critical points & verify maxima or minima.

$f(x) = 2x^3 + 6x^2 + 3x$

$f'(x) = 6x^2 + 12x + 3$.

$\therefore \Rightarrow 6x^2 + 12x + 3 = 0$

$\Rightarrow 2x^2 + 4x + 1 = 0$

$\Rightarrow$

$a = 2 \quad b = 4, \quad c = 1$.

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

$$= \frac{-4 \pm \sqrt{16 - 4(2)(1)}}{2(2)}$$

$$= \frac{-4 \pm \sqrt{16 - 8}}{4}$$

IMPORTANT NOTES

$$= \frac{-4 \pm \sqrt{8}}{4}$$

$$= x_1 \simeq \frac{-4 + \sqrt{8}}{4} \simeq -0.29$$

$$x_2 = \frac{-4 - \sqrt{8}}{4} \simeq -1.70$$

$\therefore f'(x) = 2x^2 + 4x + 1$

$f''(x) = 4x + 4 = 0$

$\Rightarrow x + 1 = 0$

Substituting $x_1 \simeq -0.29$

$f''(x) = -0.29 + 1$

$= 0.71 > 0$

Substituting $x_1 = -1.70$

$f''(x) = -1.70 + 1$

$= -0.70 < 0$

$\therefore x \simeq -0.29 \rightarrow$ minima

$x = -1.70 \rightarrow$ maxima

8 am
9 am
10 am
11 am
12 noon
1 pm
2 pm
3 pm
4 pm
5 pm
6 pm
Eve.

IMPORTANT NOTES

(4) $y = 2x_1^2 + 2x_1x_2 + 2x_2^2 + 6x_1$

partial derivative.

$\frac{\partial y}{\partial x_1} = 4x_1 + 2x_2 + 6$ — (1)

$\Rightarrow 2x_1 + x_2 = -3$ — (1)

$\frac{\partial y}{\partial x_2} = 4x_2 + 2x_1$ — (2)

$\Rightarrow 2x_2 + x_1 = 0$ — (2)

$x_1 = -2x_2$

Solving equation (1) & (2).

$2(-2x_2) + x_2 = -3$

$\Rightarrow -4x_2 + x_2 = -3.$

$\Rightarrow -3x_2 = -3.$

$\therefore x_2 = 1.$

$\therefore x_1 = -2(1) = -2.$

$x_1 = -2.$

IMPORTANT NOTES

$$\frac{\partial y}{\partial x_1} = 4x_1 + 2x_2 + 6$$

$$\frac{\partial^2 y}{\partial x_1^2} = 4 > 0$$

$$\frac{\partial^2 y}{\partial x_2} = 4x_2 + 2x_1$$

$$\frac{\partial 2y}{\partial x_2^2} = 4 > 0$$

∴ Both Points holds ~~Sufficiency~~ condition, positive.

So Points $x_1 = -2$

& $x_2 = 1$

are minima Points

IMPORTANT NOTES