

Ques:- find local max. & min. if Any. # AOD #

$$a) f(x) = x^3 - 6x^2 + 9x + 15$$

$$\rightarrow f'(x) = \frac{3x^2 - 12x + 9}{3(x^2 - 4x + 3)} \quad \begin{matrix} 69 \\ 54 \end{matrix}$$

$$= 3(x^2 - 3x - x + 3)$$

$$f'(x) = 3[x(x-3) - 1(x-3)] = 3(x-3)(x-1)$$

$$\text{Let } f'(x) = 0 \Rightarrow 3(x-3)(x-1) = 0$$

$$\Rightarrow \boxed{x = 1, 3}$$

$$\# \text{ again diff} \rightarrow 6x - 12 = 6(x-2)$$

$$\text{put } x=1 \rightarrow f''(1) = 6(1-2) \rightarrow -(\text{ve.}) \Rightarrow \text{Point of max.}$$

$$x=3 \rightarrow f''(3) = 6(3-2) \rightarrow +(\text{ve.}) \rightarrow \text{point of min.}$$

$$\text{So Value of } f(x) \rightarrow \text{min} \rightarrow (3)^3 - 6(3)^2 + 9(3) + 15 = 15$$

$$\text{max} \rightarrow (1)^3 - 6(1)^2 + 9(1) + 15 = 19 \checkmark$$

AOD

Ques:- find local max. & min. w/θ

Any.

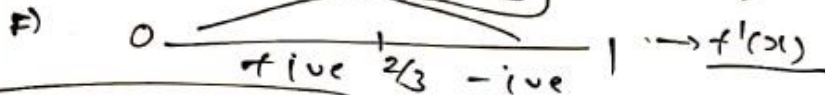
b) $f(x) = x\sqrt{1-x}$; $(0 < x < 1)$

Solⁿ: $f'(x) = x \cdot \frac{1 \cdot \sqrt{1-x} - 1 \cdot \frac{1}{2}\sqrt{1-x}}{\sqrt{1-x} \cdot \sqrt{1-x}}$

$f'(x) = \frac{-x + 2(1-x)}{2\sqrt{1-x}} = \frac{-x + 2 - 2x}{2\sqrt{1-x}}$

$f'(x) = \frac{2-3x}{2\sqrt{1-x}} \rightarrow$ let $f'(x) = 0$

$\Rightarrow 2-3x = 0 \Rightarrow x = \frac{2}{3} \in (0, 1)$



So! $x = \frac{2}{3}$ is point of max.

& maximum value of $f(x)$

$\Rightarrow f(\frac{2}{3}) = \frac{2}{3} \sqrt{1 - \frac{2}{3}} = \frac{2}{3} \times \frac{1}{\sqrt{3}}$

a) $f(x) = x^3 - 6x^2 + 9x + 15$

$\rightarrow f'(x) = \frac{3x^2 - 12x + 9}{1} = 3(x^2 - 4x + 3)$

$f'(x) = 3[x(x-3) - 1(x-3)] = 3(x-3)(x-1)$

let $f'(x) = 0 \Rightarrow 3(x-3)(x-1) = 0$

$\Rightarrow x = 1, 3$

again diff $\rightarrow 6x - 12 = 6(x-2)$

put $x=1 \rightarrow f''(1) = 6(1-2) \rightarrow -ive. \Rightarrow$ Point of max.

$x=3 \rightarrow f''(3) = 6(3-2) \rightarrow +ive \rightarrow$ point of min.

So Value of $f(x) \rightarrow$ min $\rightarrow (3)^3 - 6(3)^2 + 9(3) + 15 = 15$

max $\rightarrow (1)^3 - 6(1)^2 + 9(1) + 15 = 19$

H.W
Ex:- $g(x) = x^3 - 3x$

AOD

Ques: prove that $f(x) = e^x$ do not have max. or min.

Q prove that $y = \log|x|$ doesn't have max. or min.

Solⁿ: - $f(x) = e^x$

$$\Rightarrow f'(x) = e^x$$

$$\text{Let } f'(x) = 0$$

$$\Rightarrow e^x = 0$$

but for exponential fun. there is no value of x for which $e^x = 0$

So there doesn't exist $x \in \mathbb{R} \rightarrow f'(x) = 0$

So there is neither max. nor min. \checkmark

Solⁿ: $f(x) = \log|x| \Rightarrow f'(x) = \frac{1}{x}$

Here $\log|x|$ is always is Define for positive value of x .

\therefore There is no value of x for which $f'(x) = 0$

Sol: - $f(x) = \log|x|$ neither have max. nor min.

AOD

Ques: prove that $f(x) = e^x$ do not have max. or min.

(Q prove that $y = \log x$ doesn't have max. or min.)

Solⁿ: - $f(x) = e^x$
 $\Rightarrow f'(x) = e^x$
 Let $f'(x) = 0$
 $\Rightarrow e^x = 0$

Solⁿ: $f(x) = \log x \Rightarrow f'(x) = \frac{1}{x}$
 Here $\log x$ is always is Define for positive value of x .

but for exponential fun. there is no value of x for which $e^x = 0$

\therefore There is no value of x for which $f'(x) = 0$

So there doesn't exist $x \in \mathbb{R} \rightarrow f'(x) = 0$

Sol. - $f(x) = \log x$ neither have max. nor min.

So there is neither max. nor min. \checkmark

- ① AOD $\rightarrow 5$
- ② Derivation $\rightarrow 3$
- ③ Relation & fun $\rightarrow 2$

hw $\left[f(x) = x^3 + x^2 + x + 1 \right]$
 $\underline{-8} + \underline{4} - \underline{2} + \underline{1} = \underline{-5}$