AOD

Ques:- Find local max. & min. if Any.

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

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

$= 3[x^2 - 3x - x + 3]$

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

69
54

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

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

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

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

H.W

Ex:- $\boxed{g(x) = x^3 - 3x}$

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

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

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

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

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

0 — +ive — 2/3 — -ive — 1 $\rightarrow f'(x)$

So: $x = 2/3$ is point of max.

& maximum value of $f(x)$

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

AOD

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

Sol^n:- $f(x) = e^x$

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

let $f'(x) = 0$

$\Rightarrow \boxed{e^x = 0}$

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

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

So there is neither max. nor min. A

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

Sol^n: $f(x) = \log x \Rightarrow f'(x) = \frac{1}{x}$

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

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

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

AOD

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Sol^n:- $f(x) = e^x$

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

let $f'(x) = 0$

$\Rightarrow \boxed{e^x = 0}$

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

So there is neither max. nor min. A

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

Sol^n: $f(x) = \log x \Rightarrow f'(x) = \frac{1}{x}$

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

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

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

① AOD → 5

② Derivation → 3

③ Relation & fun → 2

H.W. $\left[f(x) = x^3 + x^2 + x + 1\right]$

$-8 + 4 - 2 + 1 = -5$