AOD

Ques:- find a so that $\boxed{f(x) = \sin x - 2(a-1)x}$, possess critical point.

Sol^n:- Diff $f(x) \rightarrow f'(x) = \cos x - 2(a-1) \rightarrow$ let $f'(x) = 0$ for critical points

$\Rightarrow \cos x - 2(a-1) = 0 \Rightarrow \cos x = 2(a-1)$

$\therefore \quad -1 \leq 2(a-1) \leq 1 \Rightarrow -1 \leq 2a - 2 \leq 1 \Rightarrow -1+2 \leq 2a \leq 1+2$

$\Rightarrow \quad \frac{1}{2} \leq a \leq \frac{3}{2}$ So: $a = [\frac{1}{2}, \frac{3}{2}]$ Ans

Note:- point at which $f'(x) = 0$ is called stationary point.

Ques The stationary point of $f(x) = e^x + e^{-x}$ is

Sol^n:- diff $f(x) \rightarrow f'(x) = e^x - e^{-x} \Rightarrow \therefore f'(x) = 0 \Rightarrow e^x - e^{-x} = 0$

$\Rightarrow e^x - \frac{1}{e^x} = 0 \Rightarrow \frac{e^{2x} - 1}{e^x} = 0 \Rightarrow e^{2x} = 1 \Rightarrow x = 0$ Ans

$\Rightarrow e^{2x} = e^0 \Rightarrow 2x = 0$

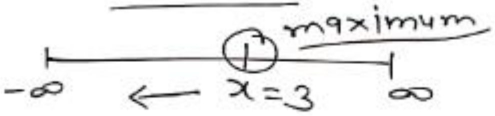
$x = 0$

AOD

Ways to finding Maxima & Minima :-

① First Derivative Test → $f'(x)$ (Graph)

$f(x) \le 3$



② Second Derivative Test → $f'(x)$ → $f''(x)$ (critical points)

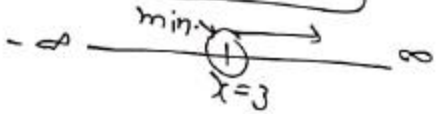
Ques: Find max. and min. value if any :-

a) $f(x) = (2x-1)^2 + 3$

Sol^n: Here $(2x-1)^2 \ge 0$

$\Rightarrow (2x-1)^2 + 3 \ge 3$

$\Rightarrow \boxed{f(x) \ge 3}$



So here it is clear that the value of fun $f(x)$ is always greater than or equal to 3.

$\therefore$ 3 will be the minimum value of the fun. $f(x)$.

& there is no max. value.

And here the min. value 3 will occur :- when $(2x-1)^2 = 0$

$\therefore 2x-1 = 0 \Rightarrow x = 1/2$

& $f(x) = 0 + 3 = 3$ (min. value).

AOD

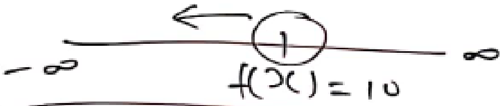
Q. b) $f(x) = -(x-1)^2 + 10$

Sol^n: $\because (x-1)^2 \geq 0$

$\therefore -(x-1)^2 \leq 0$

$\Rightarrow -(x-1)^2 + 10 \leq 10$

$\Rightarrow f(x) \leq 10$



4) $\boxed{g(x) = x^3 + 1}$

c) $f(x) = 9x^2 + 12x + 2$

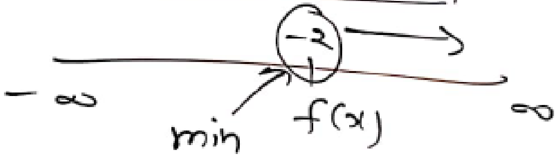
$= (3x)^2 + 2\times 3x \times 2 + (2)^2 - 2$

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

$\because (3x+2)^2 \geq 0$

$\therefore (3x+2)^2 - 2 \geq -2$

$\boxed{f(x) \geq -2}$



So $f(x)$ has min value i.e. $= -2$

& there is no max. value.