Q $f(x) = 3x^3 - 18x^2 + 27x - 40$

Mains

on the Set $S = \{x \in R,\ x^2 + 30 \le 11x\}$

find Max^m Value.

$f'(x) = 9x^2 - 36x + 27$

$= 9(x^2 - 4x + 3)$

$= 9(x-1)(x-3)$

$x^2 - 11x + 30 \le 0$

$(x-5)(x-6) \le 0$

$5 \le x \le 6$

Max^m at $x=6$

$f(6) = 3 \times 216 - 18 \times 36 + 27 \times 6 - 40$

$= 122$

Q f be a fxn defined on R Such that

IIT

$f'(x) = 2010(x-2009)(x-2010)^2(x-2011)^3(x-2012)^4$

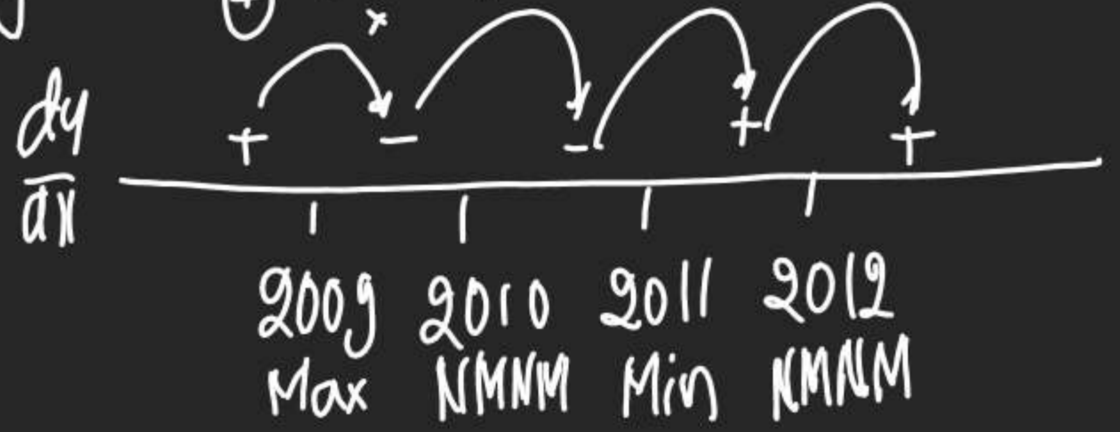
$\forall x \in R$. If g is a fxn defined on R with values $(0,\infty)$ Such that $f(x) = \ln g(x)$

The No of Pts at which g has L.Max?

$g(x) = e^{f(x)}$

$g'(x) = e^{f(x)} \times f'(x)$

$g'(x) = \underset{\oplus}{e^{f(x)}} \times 2010\,(x-2009)^1(x-2010)^2(x-2011)^3(x-2012)^4$



Only 1 Pt of Max. $x=2009$

Q $f(x)=\begin{cases}3x^2+12x-1 & -1\le x\le 2\\ 37-x & 2<x\le 3.\end{cases}$

then WOTF is Correct.

(A) Cont^s $[-1,3]$ (B) Max^m $x=2$

(C) Diff in $[-1,3]$ (D) NOT

A) Cont^s → $x=2$ 4R

$3(2)^2+12\times2-1=37-2$

$35=35$

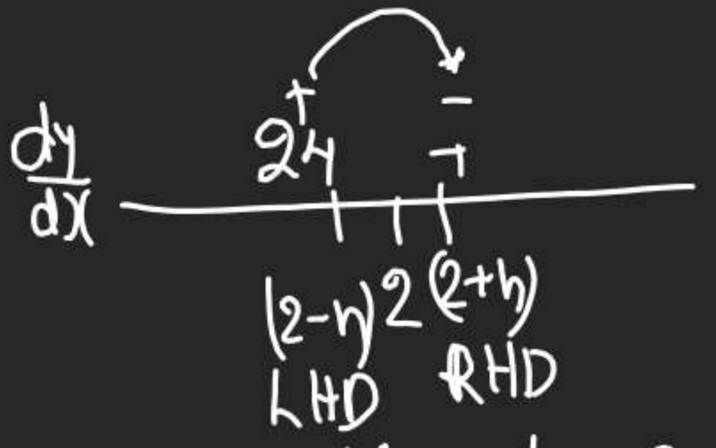
B) Diff

$f'(x)=\begin{cases}6x+12 & -1\le x\boxed{\le 2}\\ -1 & \boxed{2<}x\le 3\end{cases}$

$x=2$ $LHD=6\times2+12=24$

$RHD=-1$

$LHD\ne RHD \Rightarrow$ Not diff



Max at $x=2$

Main

Q If S_1 & S_2 are Sets of LMin LMax of fxn $f(x)=9x^4+12x^3-36x^2+25\ \forall\ x\in R$

then $S_1=\{\_\ \_\}$, $S_2=\{\_\ \_\}$

$S_1=-2,+1$, $S_2=0$

Main

Q Set of all Real values of λ for which fxn $f(x)=(1-\cos^2x)(\lambda+\sin x)$ $x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ has only one Max & one Min is ......?

$f(x)=\sin^2x(\lambda+\sin x)=\lambda\sin^2x+\sin^3x$

$f'(x)=2\lambda\sin x\cdot\cos x+3\sin^2x\cdot\cos x$

$=\sin x\cdot\cos x(2\lambda+\underline{3\sin x})$

$\lambda\in\left(-\frac{3}{2},\frac{3}{2}\right)-\{0\}$

$\sin x=0$, $x=0$ $\quad$ $\cos x\ne0$ $\quad$ $2\lambda+3\sin x=0$, $\sin x=-\frac{2\lambda}{3}$?

$-1<-\frac{2\lambda}{3}<1$

$\sin x=-\frac{2\lambda}{3}$

$\frac{3}{2}>\lambda>-\frac{3}{2}$

Nishant Jindal

Q IIT $f: R \to R$ be defined as $f(x) = |x| + |x^2-1|$. Find total No of Pts at which $f(x)$ attains either L Max or L Min = 5 बिन्दुओं पर उच्चिष्ठ/निम्निष्ठ

$x \neq 0$, $x \neq \pm 1$

$f(x) = |x| + |x^2-1|$

$f'(x) = \frac{|x|}{x} + \frac{|x^2-1|}{(x^2-1)} \times (2x)$

$$f'(x) = \begin{cases} 2x+1=0 \quad \cancel{-\frac{1}{2}} & x > 1 \\ 1-2x=0 \quad \frac{1}{2} ✓ & 0 < x < 1 \\ -1-2x=0 \quad -\frac{1}{2} ✓ & -1 < x < 0 \\ 2x-1=0 \quad \frac{1}{2} & x < -1 \end{cases}$$

→ ये Proper Cr. pt नहीं है।

Q Find all Possible values of a for which fxn $f(x) = x^3 + 3(a-7)x^2 + 3(a^2-9)x - 1$ has +ve Pt. of Max^ma ? = Origin से Rt Side पर Max^ma

Mains

Rem:- This is Indirect QS of LOR.

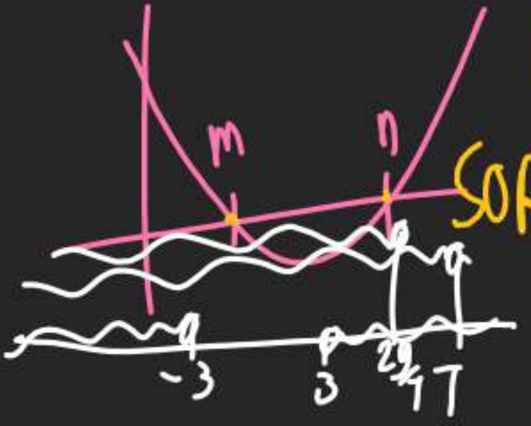
$f(x) = \boxed{x^3} + 3(a-7)x^2 + 3(a^2-9)x - 1$ आदि

↳ L. Coff = 1 > 0

graph

Max^ma/Min Both +ve

$f'(x) = 3x^2 + 6(a-7)x + 3(a^2-9)$



m, n +ve

SOR = m+n +ve

$-\frac{b}{a} > 0$ | POR $\frac{C}{A} > 0$ | $f(0) > 0$

$3(a^2-9) > 0$

$(a-3)(a+3) > 0$

② $-\frac{B}{A} > 0 \Rightarrow \frac{B}{A} < 0$

$\frac{6(a-7)}{3} < 0$

$a < 7$

③ $\frac{C}{A} > 0$

$\frac{3(a^2-9)}{3} > 0$

$a < -3 \cup a > 3$

④ $D > 0$

$36(a-7)^2 - 36(a^2-9) > 0$

$a^2 - 14a + 49 - a^2 + 9 > 0$

$14a < 58$

$a < \frac{29}{7}$ $a \in (-\infty, -3) \cup (3, \frac{29}{7})$

M2

① $D > 0$ | ② $m < -\frac{b}{2a} < n$ | ③ $f(0) > 0$

(M3) KKK

Pt of Max^ma ⊕

If it is clear that Max/Min Both +ve/−ve

① $0 < \alpha_{Max} < \beta_{Min}$

② $\alpha = \frac{-6(a-7) + \sqrt{\ }}{6} > 0$

→ ये Solve करो

$a < -3 \cup a > 3$

Board S.D.T. (Second Derivative Test).

Basic → Con. up   Con down

Min

$\frac{d^2y}{dx^2} > 0$

$\frac{d^2y}{dx^2} < 0$

① $f'(x) = 0 \to$ (r. pt (a, b)

② $\left.\frac{d^2y}{dx^2}\right|_{x=a} = \oplus$ $x = a$ is Min Pt

$\left.\frac{d^2y}{dx^2}\right|_{x=b} = \ominus$ $x = b$ is Max^m Pt.

if

③ $\left.\frac{d^2y}{dx^2}\right|_{x=a} = 0$ (न + न -)

नति परिवर्तन बिंदु

(Pt. of Inf)

↓

शंका

④ $\left.\frac{d^3y}{dx^3}\right|_{x=a} \neq 0 + ve / - ve$

(पक्का)

PoI

(5) But if $\left.\frac{d^3y}{dx^3}\right|_{x=a} = 0$

(शंका के दु निवारण)

(6) $\left.\frac{d^4y}{dx^4}\right|_{x=a} = \oplus$ Min

$\ominus$ Max.

$= 0$ (शंका)

Even derivative $\oplus$ Min

$\ominus$ Max.

$= 0$ शंका

$y = x^3$

1) $\frac{dy}{dx} = 3x^2 = 0$

$x = 0$

2) $\frac{d^2y}{dx^2} = 6x$

$\left.\frac{d^2y}{dx^2}\right|_{x=0} = 6 \times 0 = 0$

(शंका)

3) $\left.\frac{d^3y}{dx^3}\right|_{x=0} = 6 \neq 0$

(पक्का)

$x = 0$ is Po If.

$y = x^4.$

1) $\frac{dy}{dx} = 4x^3 = 0$

$x = 0$

2) $\frac{d^2y}{dx^2} = 12x^2$

$\left.\frac{d^2y}{dx^2}\right|_{x=0} = 12 \times 0^2 = 0$

(शंका)

(3) $\frac{d^3y}{dx^3} = 24x$

$\left.\right|_{x=0} = 24 \times 0 = 0$

के दुनिवारण

(4) $\left.\frac{d^4y}{dx^4}\right|_{x=0} = 24 \oplus$

Min $x = 0$