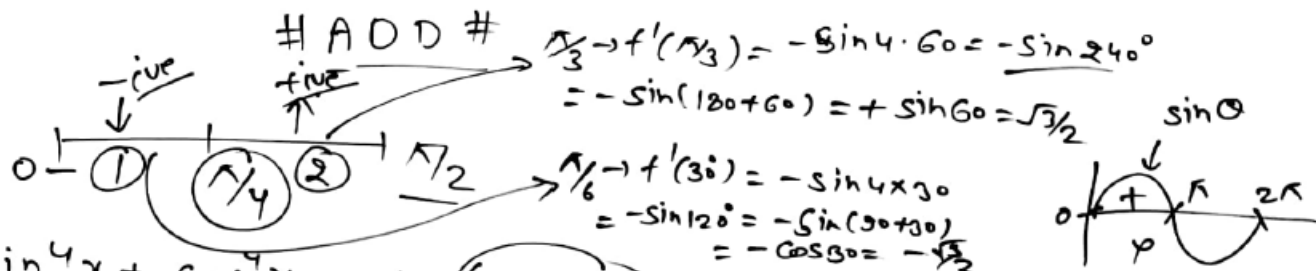


Ex:-



Ques:

Solⁿ:-

$\sin^4 x + \cos^4 x \rightarrow (0, \pi/2)$

Let $f(x) = \sin^4 x + \cos^4 x$

diff $\rightarrow f'(x) = 4 \cdot \sin^3 x \times \cos x + 4 \cos^3 x \times (-\sin x)$

$\rightarrow f'(x) = 4 \sin x \cdot \cos x (\sin^2 x - \cos^2 x) = -4 \cdot \sin x \cdot \cos x \cdot \cos 2x$

$\rightarrow f'(x) = -2x \sin 2x \times \cos 2x = -\sin 4x \Rightarrow f'(x) = -\sin 4x$

i) $\because f(x)$ is $\uparrow \rightarrow f'(x) > 0 \Rightarrow -\sin 4x > 0 \Rightarrow \sin 4x < 0 \Rightarrow 4x \in (\pi, 2\pi)$
 or $x \in (\frac{\pi}{4}, \frac{\pi}{2})$

\rightarrow So it mean $f(x) \rightarrow$ increasing fun. when $x \in (\frac{\pi}{4}, \frac{\pi}{2})$

ii) $f(x)$ is \downarrow when $f'(x) < 0 \Rightarrow -\sin 4x < 0 \Rightarrow \sin 4x > 0 \Rightarrow 4x \in (0, \pi)$

So $f(x)$ is \downarrow when $x \in (0, \frac{\pi}{4})$

Ex:- Find approx. value of $f(x) = x^2 - 2x - 3$ at $x = 1.999$.

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

$\therefore x = 1.999 \rightarrow \therefore a = 2$ & $h = -0.001$

formula:

So! $\rightarrow f(a+h) = f(a) + h \cdot f'(a)$

$$f(2 + (-0.001)) = f(2) + (-0.001) \cdot f'(2) \quad \text{--- (1)}$$

Here:- $f(2) = (2)^2 - 2(2) - 3 = -3 \quad \text{--- (2)}$

$$f'(2) = ? \rightarrow f'(x) = 2x - 2$$

$$\therefore f'(2) = 2(2) - 2 = 2 \quad \text{--- (3)}$$

From (1) (2) & (3):-

$$f(1.999) = -3 - 0.001 \times 2$$

$$= -3 - 0.002 = \underline{\underline{-3.002}} \quad \checkmark \checkmark$$

ADD

Ex-1 - find approx. value of $f(5.001) \rightarrow$ i.e. $f(x) = x^3 - 7x^2 + 15$

Solⁿ: $\therefore f(x) = x^3 - 7x^2 + 15 \rightarrow$ at $x = 5.001$ $\leftarrow \begin{matrix} 5 \\ 0.001 \end{matrix}$

Here :- $a = 5$ & $h = 0.001$

Formula $\therefore \boxed{f(a+h) = f(a) + h \cdot f'(a)}$

$\therefore f(5 + (0.001)) = f(5) + (0.001) \cdot f'(5)$

$\therefore f(5) = 125 - 175 + 15 = \underline{-35}$

& $f'(x) = 3x^2 - 14x$

$\therefore f'(5) = 3(5)^2 - 14 \times 5 = 75 - 70 = 5$

So :- $f(5.001) = -35 + 0.001 \times 5$

$= -35 + 0.005$

$= -34.995$ ✓✓✓

$f(x) = x^3 - 7x^2 + 15$

$f(5) = (5)^3 - 7(5)^2 + 15$

H.W $f(2.01)$

$f(x) = 4x^2 + 5x + 2$