

Relative / Local Maximum of function

at point $x=a$

if $f(x) \leq f(a)$ $\forall x \in (a-\delta, a+\delta), \delta > 0$

δ very small

\Rightarrow f has local maximum at $x=a$

Continuous (non constant)



$$\begin{array}{c}
 \text{Sign scheme} \\
 \text{of } f'(x) \quad \begin{array}{c} + \\ \downarrow \\ - \end{array} \\
 \begin{array}{ccc} x=a-h & x=a & x=a+h \end{array}
 \end{array}$$

critical point

→ First Derivative
+ cst

f is strictly ↑ $(a-\delta, a)$
↓ $(a, a+\delta)$

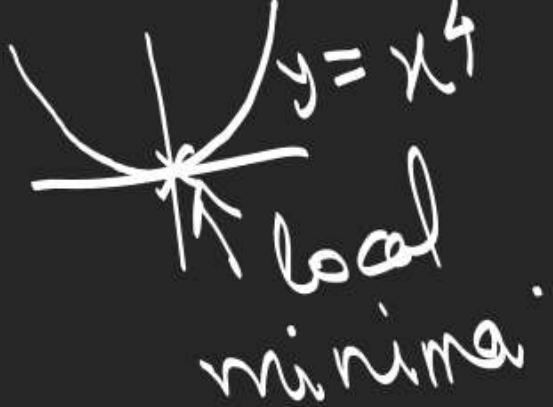
Second Derivative Test.

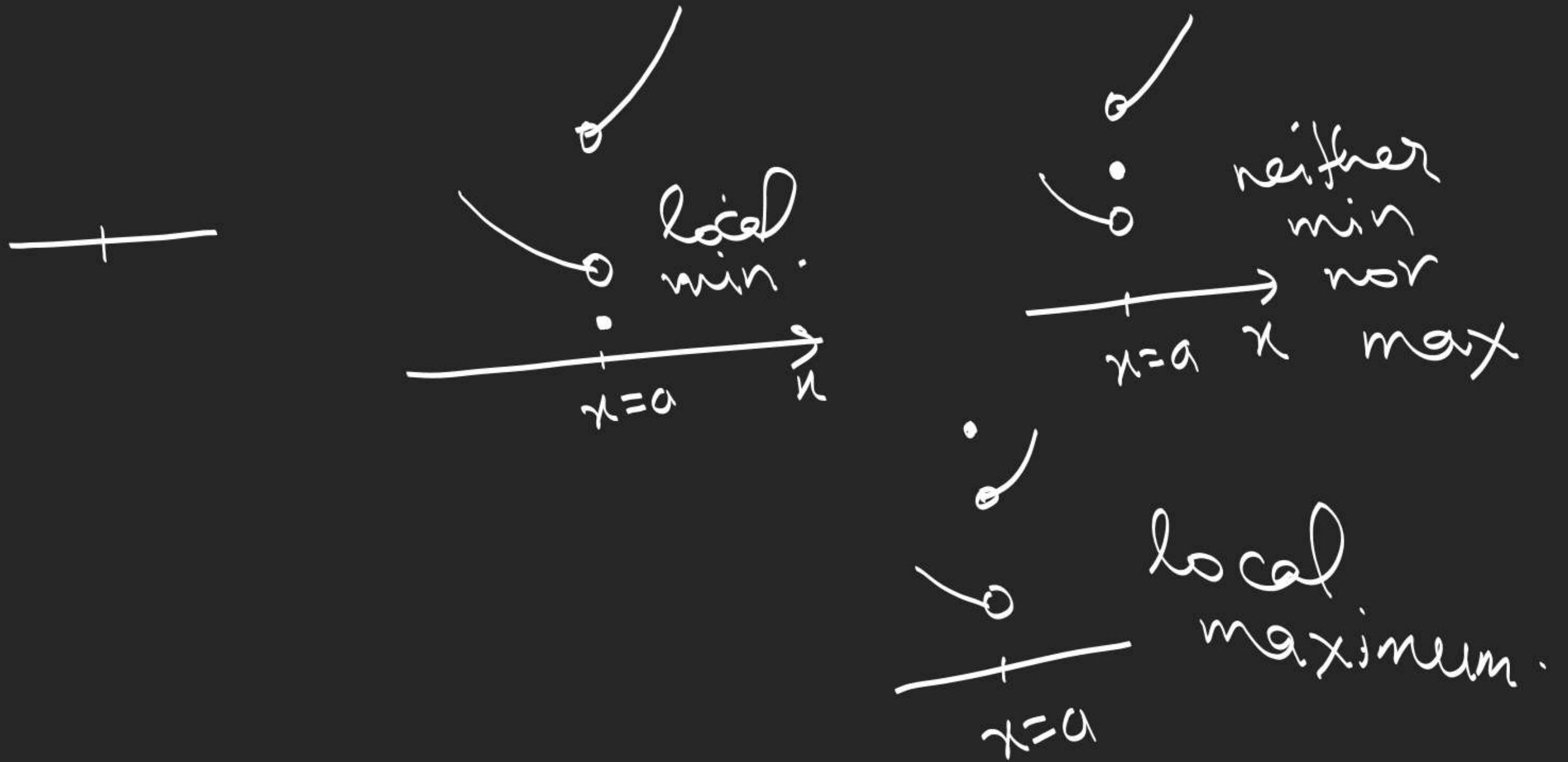
If $f'(a) = 0$ & $f''(a) < 0$

$\Rightarrow x=a$ is local maximum.

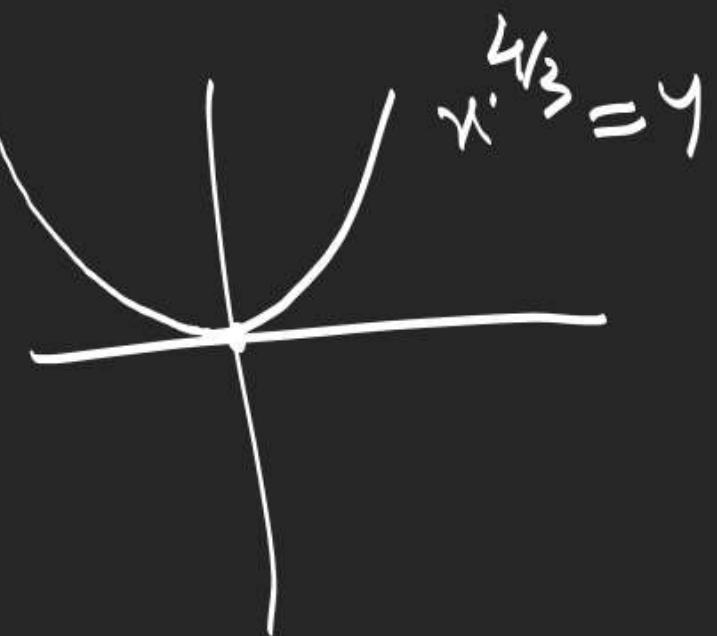
Method fails if $f''(a) = 0$ or Doesn't exist.

$$f(x) = \begin{cases} x^4 & \rightarrow \text{minimum} \\ -x^4 & \text{at } x=0 \rightarrow \text{maximum} \\ x^3 & \rightarrow \text{neither max. nor min} \end{cases}$$





$$f(x) = \begin{cases} x^{4/3} & \rightarrow \min \\ -x^{4/3} & \text{at } x=0 \\ x^{7/5} & \rightarrow \max \\ \text{neither min nor max} \end{cases}$$



Monotonicity

Ex-I (1 to 15)
- {13}