

Q1].. State the second derivative test.

Suppose  $f'(c) = 0$

① If  $f''(c) > 0 \Rightarrow$  LOCAL MIN at  $c$

② If  $f''(c) < 0 \Rightarrow$  LOCAL MAX at  $c$ .

③ If  $f''(c) = 0$ , then NO CONCLUSION.

Find the critical points of the function  $f(x) = 1 + 2x^2 - x^4$  and test them using the second derivative test.

$$f'(x) = 4x - 4x^3 = 4x(1-x^2) = 4x(\cancel{1-x})(1+x)$$

$x=0, x=-1, x=1$  CRITICAL PTS

$$f''(x) = 4 - 12x^2$$

$$f''(0) = 4 - 12(0)^2 = 4 > 0 \Rightarrow \text{LOCAL } \underline{\underline{\text{MIN}}} \text{ AT } 0$$

$$f''(1) = 4 - 12(1)^2 = -8 < 0 \Rightarrow \text{LOCAL } \underline{\underline{\text{MAX}}} \text{ at } 1$$

$$f''(-1) = 4 - 12(-1)^2 = -8 < 0 \Rightarrow \text{LOCAL } \underline{\underline{\text{MAX}}} \text{ at } -1$$