

EX1  $\Rightarrow f(x) = x^3 - 3x^2 + 3x + 1$

$$f'(x) = 3x^2 - 6x + 3 = 0$$

$$3(x^2 - 2x + 1) = 0$$

$$3(x-1)(x-1) = 0$$

$$x = 1$$

EX2  $\Rightarrow f(x) = x^3 - \frac{3}{2}x^2$

$$f'(x) = 3x^2 - 3x = 0$$

$$3x(x-1) = 0$$

$$x = 0, 1$$

$$\begin{array}{c|c} + & + \\ \hline f'(0) & f'(2) \\ | & \\ \hline \end{array}$$

$f(x)$  is inc. on  $(-\infty, \infty)$

$$\begin{array}{c|c|c} + & - & + \\ \hline f'(-1) & f'(\frac{1}{2}) & f'(2) \\ | & | & \\ \hline \end{array}$$

$f(x)$  is inc. on  $(-\infty, 0), (1, \infty)$   
dec. on  $(0, 1)$

# \* 1st Derivative Test

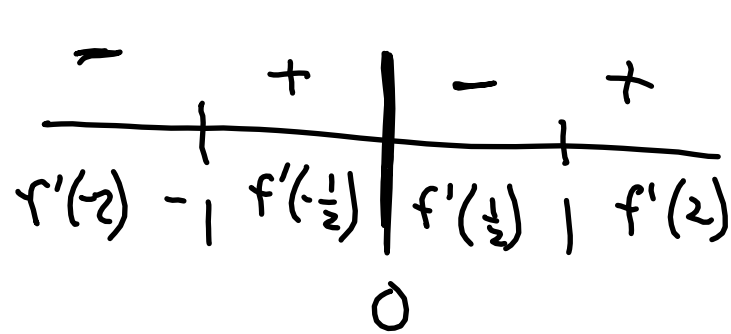
→ If  $f'(x)$  changes from positive to negative @  $x=c$ , then  $f(x)$  has a relative maximum @  $x=c$

→ If  $f'(x)$  changes from negative to positive @  $x=c$ , then  $f(x)$  has a relative minimum @  $x=c$

EX1 →  $f(x) = \frac{x^4 + 1}{x^2}$

$$f'(x) = \frac{(x^2)(4x^3) - (x^4 + 1)(2x)}{x^4} = \frac{4x^5 - 2x^5 - 2x}{x^4} = \frac{2x(x^4 - 1)}{x^4} = \frac{2(x^2 + 1)(x^2 - 1)}{x^3} = \frac{2(x^2 + 1)(x+1)(x-1)}{x^3}$$

= 0 @  $x = \pm 1$ , V.A. @  $x = 0$



$f(x)$  is inc. on  $(-1, 0), (1, \infty)$   
 dec. on  $(-\infty, -1), (0, 1)$

$f(x)$  has rel. minima @  $x = \pm 1$

HW: p. 186 → 4-46 even, 61-64, 80, 85-88