

Find c.n. of $f(x) = \begin{cases} x^2 - 2x & x \leq 0 \\ 2x & x > 0 \end{cases}$.

$$f'(x) = \begin{cases} 2x - 2 & x < 0 \\ 2 & x > 0 \end{cases}$$

$$f'(x) \neq 0$$

f' $\nexists$ at $x=0$ because $f'_+(0)=2$ but $f'_-(0)=-2$

$\therefore$ only c.n. is $x=0$.

2.381

Find the rel. min of $f(x) = x + \frac{1}{x^2}$.

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

$f' \nexists$ at $x=0$ (not c.n. $0 \notin f$)

$$f'(x) = 0 \rightarrow x = \sqrt[3]{2}$$

$$f''(x) = \frac{6}{x^4}$$

f has a rel min of 1.890 at $x = \sqrt[3]{2}$

because $f''(\sqrt[3]{2}) = 2.381 > 0 \rightarrow f$ is CU.

Find the abs. ext of $f(x) = (x-1)^{1/3} + 4$ on $[0, 2]$.

$$f'(x) = \frac{1}{3\sqrt[3]{(x-1)^2}}$$

$$f'(x) \neq 0$$

$$f' \nexists \text{ at } x=1$$

$$f(0) = 3$$

$$f(2) = 5$$

$$f(1) = 4$$

$\therefore$ by the EVT f has an
abs max of 5 at $x=2$
and an abs min of 3 at $x=0$.