

$$f(x) = x^{2/3} \quad [-1, 1] \quad \sqrt[3]{x^2}$$

1) continuous on $[-1, 1]$ ✓

2) differentiable on $(-1, 1)$ ✗

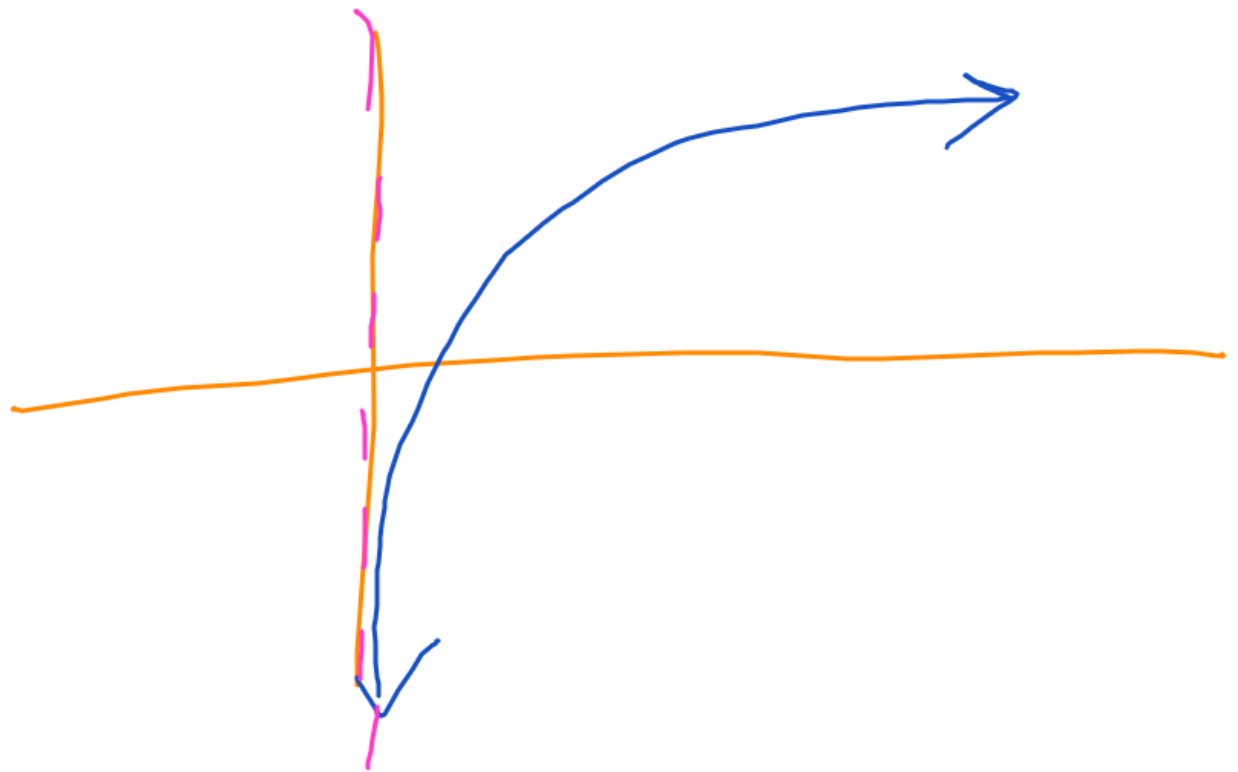
$$f'(x) = \frac{2}{3} x^{-1/3} \rightarrow \frac{2}{3\sqrt[3]{x}}$$

not diff b/c the derivative
is not defined @ $x=0$

$$f(x) = \underbrace{e^x + \ln(x)}_{[-1, 1]}$$

1) cont. on $[-1, 1]$ X

2) diff. on $(-1, 1)$



$$f(x) = x^2 \cos(x) \quad \text{on } [-\pi, \pi]$$

- 1) cont. on $[-\pi, \pi]$ ✓
2) diff. on $(-\pi, \pi)$ ✓
- MVT does apply ✓

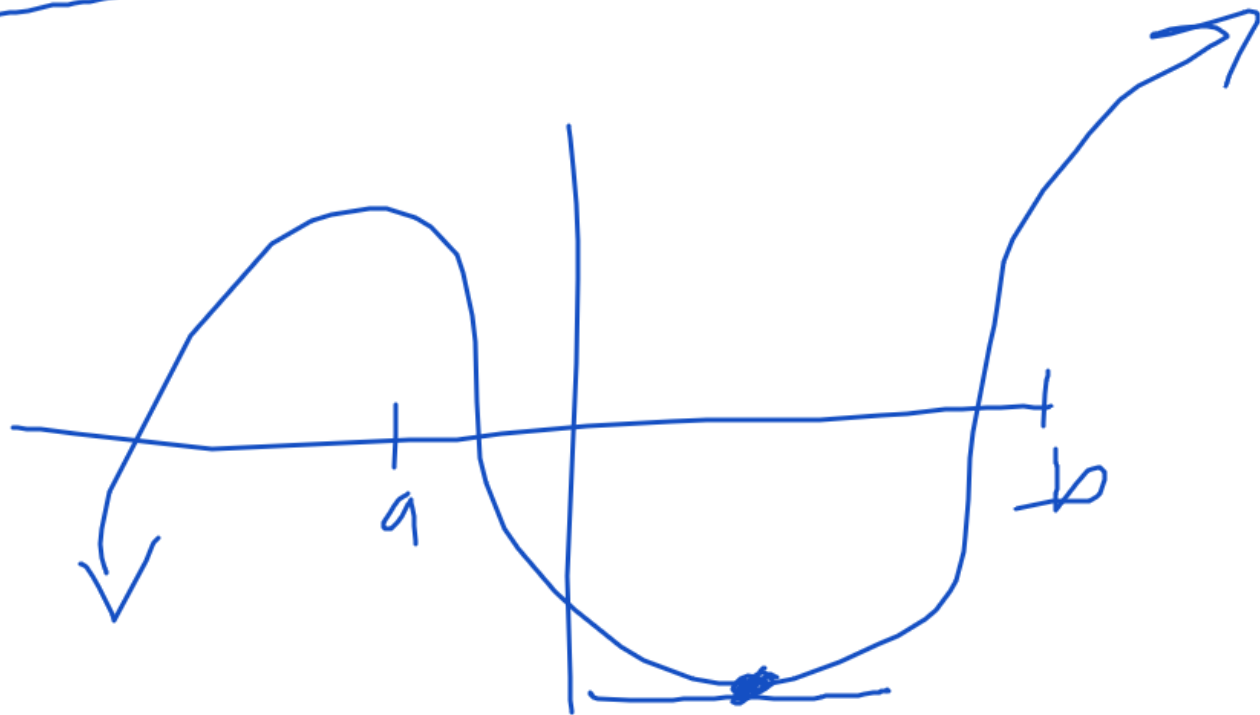
$$f'(x) = 2x \cos x - x^2 \sin x$$

$$3) f(a) = f(b)$$

$$\left. \begin{aligned} f(-\pi) &= (-\pi)^2 \cos(-\pi) = \pi^2 (-1) = -\pi^2 \\ f(\pi) &= (\pi)^2 \cos(\pi) = \pi^2 (-1) = -\pi^2 \end{aligned} \right\} \sqrt{f'(c) = 0}$$

$$[a, b] \subseteq \mathbb{C}$$

$$\underline{f'(c) = 0}$$



$$f(x) = x^2 \cos(x)$$

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

$$0 = 2x \cos x - x^2 \sin x$$

$$0 = x(2 \cos x - x \sin x)$$

$$\boxed{x=0}$$

$$0 = 2 \cos x - x \sin x \rightarrow 2 \cos x = x \sin x$$

$$2 \cot x = x ?$$

$$c=0$$

$$f'(c) = f'(0) = 0$$

- 1) cont on $[a, b]$
- 2) diff. on (a, b)
- 3) $f(a) = f(b)$

$$f(x) = \underline{\ln(x^2) - 2x} \quad \underline{[1, 5]}$$

EVT: If $f(x)$ is continuous on $[a, b]$,
then \exists abs. max / abs. min

1) find critical points

$$f'(x) = \frac{1}{x^2} \cdot 2x - 2 = \frac{2x}{x^2} - 2 \Rightarrow \frac{2}{x} - 2 \text{ critical point}$$

$$\frac{2}{x} - 2 = 0 \Rightarrow \frac{2}{x} = 2 \Rightarrow 2 = 2x \Rightarrow \boxed{x=1}$$

$$f(x) = \frac{1}{3}x^3 - \frac{5}{2}x^2 + 6x + 4$$

$$f'(x) = \underbrace{x^2 - 5x + 6}$$

$$(x-2)(x-3) = 0$$

$$\boxed{@ x=2, x=3}$$

critical
points

check crit. points/endpoints

$$f(1) = \ln(1^2) - 2(1) = 0 - 2 = -2 \leftarrow \begin{array}{l} \text{abs.} \\ \text{max} \end{array}$$

$$f(5) = \ln(25) - 2(5) = 3.22 - 10 = -6.78$$

$\ln(x^2) - 2x$

Dis) cont,

- 1) critical points
- 2) evaluate $f(\text{critical points})$ and $f(\text{endpoints})$
- 3) the biggest # is max/smallest is min

\uparrow abs. min.