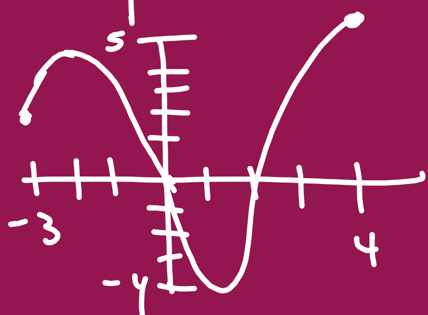
ABSOLUTE EXTREMA

$(-\infty, \infty)$

limits



$[-3, 4]$

Abs max $(4, 5)$

Abs min $(1, -4)$

$f(x) = x^2 - 3x + 2 \quad [0, 5]$

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

$x = 3/2 \longleftarrow$ check if in interval

1) Find critical pts

2) Sub crit pts + end pts in f to find highest + lowest y-coord.

$3/2$	$-1/4$
0	2
5	12

Abs max @ $(5, 12)$

Abs min @ $(3/2, -1/4)$

$f(x) = 3 - 4x - 2x^2 \quad (-\infty, \infty)$

$\lim_{x \to -\infty} -2x^2 = -2(-\infty)^2 = -\infty$

$\lim_{x \to +\infty} -2x^2 = -2(\infty)^2 = -\infty$

No abs min

If (,)

1) check limits of end points
2) Find crit pts
3) Find y-coord of crit pt + compare to limits

$f'(x) = -4 - 4x = 0$

$-4 = 4x$

$-1 = x$

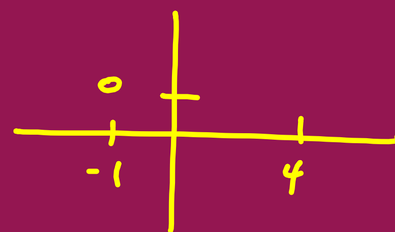
-1	$3+4-2=5$

Abs max $(-1, 5)$

No Abs min

$f(x) = (x^3-1)^{2/3} \quad (-1, 4]$

$\lim\limits_{x \to -1} (x^3-1)^{2/3} = (-1-1)^{2/3} = (-2)^{2/3} = \sqrt[3]{(-2)^2} = \sqrt[3]{4} = 1.\sim$



$f'(x) = \cancel{\frac{2}{3}}(x^3-1)^{-1/3} \cdot \cancel{3}x^2$

$0 = \dfrac{2x^2}{\sqrt[3]{x^3-1}}$

$0 = 2x^2$

$\sqrt{0} = \sqrt{x^2}$

$0 = x$

pts of non-diff

$x^3 - 1 = 0$

$x = 1$

In interval?

x	y
0	$(-1)^{2/3} = \sqrt[3]{1} = 1$
1	0
4	$(4^3-1)^{2/3} = 63^{2/3} \approx 15.83$

Abs max $(4, 63^{2/3})$

Abs min $(1, 0)$

November 20, 2023

$$f(x) = \frac{x}{x^2+1} \qquad (0, \infty)$$

$$\lim_{x \to 0} \frac{x}{x^2+1} = \frac{0}{1} = 0$$

$$\lim_{x \to \infty} \frac{\cancel{x}}{\cancel{x^2}_{\,x}} = \lim_{x \to \infty} \frac{1}{x} = \frac{1}{\infty} = 0$$

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

$$= \frac{x^2+1-2x^2}{(x^2+1)^2}$$

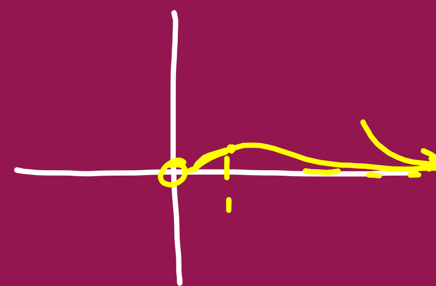
$$0 = \frac{1-x^2}{(x^2+1)^2}$$

$$0 = 1 - x^2$$

$$\sqrt{x^2} = \sqrt{1}$$

$$x = \cancel{\pm} 1$$

not in interval



1	$\frac{1}{1+1} = \frac{1}{2}$

Abs max $(1, 1/2)$

No Abs min

$f(x) = \frac{x}{e^{2x}}$ $\quad [1, \infty)$

$\lim_{x \to \infty} \frac{x}{e^{2x}} = \frac{\infty}{\infty}$

$\lim_{x \to \infty} \frac{1}{e^{2x} \cdot 2} = \frac{1}{\infty} = 0$

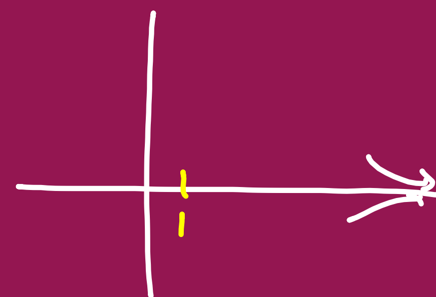
$f'(x) = \frac{e^{2x} \cdot 1 - x \cdot e^{2x} \cdot 2}{(e^{2x})^2}$

$0 = \frac{\cancel{e^{2x}}[1 - 2x]}{(e^{2x})^{\cancel{2}}}$

$0 = 1 - 2x$

$2x = 1$

~~$x = 1/2$~~ not in interval



1	$\frac{1}{e^2} = 0. \ldots$

Abs max $\left(1, \frac{1}{e^2}\right)$

No Abs min