$\boxed{\text{é NELL'ESAME}}$

MINIMIZER $f(x) = \dfrac{2x^2 - x + 1}{1 - x}$

MIN $[-2, 1/2]$

$[-2, 1/2]$ CLOSED, BOUNDED
f CONTINUOUS ON $\mathbb{R} \setminus \{1\}$
$\Rightarrow$ WEIERSTRASS
$\exists$ MIN $[-2, 1/2]$
$\exists$ MAX $[-2, 1/2]$

D: $x \neq 1$

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

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

$-2 \quad 0$

$2x^2 + 4x = 0 \qquad x = 0 \lor x = -2$

-1

$(1-x)^2 = 0$

$1 - x = 0, \; x = 1$

		-2		0		1	
	$+$		$-$		$+$		$+$
$1-x$	$+$		$+$		$+$		$-$
$1-x$	$+$		$+$		$+$		$-$
	$+$		$-$		$+$		$+$
	$\nearrow$		$\searrow$		$\nearrow$		$\nearrow$

CANDIDATES

- ON THE BOUNDARY $[-2, 1/2]$
- IN THE INTERIOR $(-2, 1/2)$

$$\frac{d}{dx} = \frac{-2x^2 + 4x}{(1-x)^2} \qquad x \neq 1$$

$x = 0 \lor x = 2$

$2 \notin (-2, 1/2)$ DISCARD

$0 \in (-2, 1/2)$ IT IS A CANDIDATE

CANDIDATES

$0, -2, 1/2$

$f(0) = 1 \quad f(-2) = \frac{11}{3} \quad f(1/2) = 2$

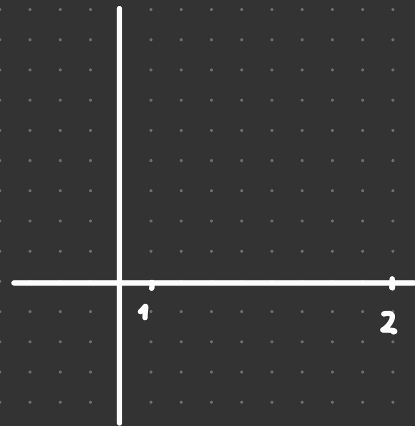
MIN $= 1$ 0 ABSOLUTE MINIMUM

MAX $= \frac{11}{3}$ -2 ABSOLUTE MAXIMIZER

$f(x) = \log(x^2 - 3x + 2)$

$x^2 - 3x + 2 > 0$

$9 - 4(2)$ $\quad \frac{3 \pm 1}{2} \begin{cases} 1 \\ 2 \end{cases}$



$+ \; 1 \; - \; 2 \; +$

$(-\infty, 1) \cup (2, +\infty)$

SIGN OF f

$f(0) = \log(2)$

$\boxed{+}$ if $x^2 - 3x + 2 > 1$

$x^2 - 3x + 1 > 0$

$+ \; - \; +$

$\frac{3 \pm \sqrt{5}}{2}$

$\frac{3-\sqrt{5}}{2}$		$\frac{3+\sqrt{5}}{2}$
$+$	$-$	$+$

f CONTINUOUS

$\lim_{x \to \pm\infty} f(x) = +\infty$

$\lim_{x \to 1^-} f(x) = -\infty$

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

ASYNDOTES

$$m = \lim_{x \to \pm\infty} \frac{f(x)}{x} = 0$$

$$q = \lim_{x \to \pm\infty} f(x) - mx = +\infty$$

NO ASYNDOTES

DERIVATE

$$f(x) = \cos(x^2 - 3x + 2)$$

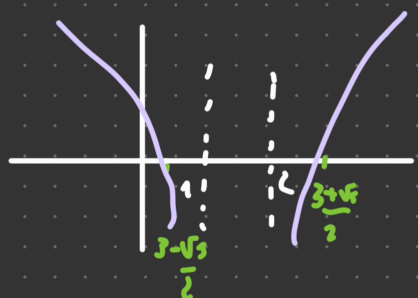
$$f'(x) = \frac{2x - 3}{x^2 - 3x + 2} \qquad x \in (-\infty, 1) \cup (2, +\infty)$$

SIGN OF $f'(x)$

$2x - 3 = 0$; $x = 3/2$ — NOT IN THE DOMAIN

$x^2 - 3x + 2 > 0 \quad \forall x \in \mathbb{R}$

$$\left.\begin{array}{l} f'(x) > 0 \quad \forall x > 2 \\ f'(x) < 0 \quad \forall x < 1 \end{array}\right\} \text{NO EXTREMUM POINT}$$



$$f(x) = |x^2-1| - \frac{1}{2}x^3 \qquad D: \mathbb{R}$$

$x^2-1>0$; $\quad$ $-1 \quad 1$; $\quad (-\infty,-1)\cup(1,+\infty)$

$x^2-1<0 \qquad (-1,1)$

f CONT ON $\mathbb{R}$

$$\lim_{x\to\pm\infty} f(x) = \mp\infty$$

DERIVATES

$$f(x)\begin{cases} x^2-1-\frac{1}{2}x^3 & (-\infty,-1)\cup(1,+\infty) \\ 1-x^2-\frac{1}{2}x^3 & (-1,1) \end{cases}$$

f IS DIFF FOR $|x|\neq 1$ THAT IS $x\neq -1$, $x\neq 1$

$$f'(x) = \begin{cases} -\frac{3}{2}x^2+2x & |x|>1 \\ -\frac{3}{2}x^2-2x & |x|<1 \end{cases} \qquad x\neq -1, 1$$

IS f DIFF IN $1, -1$?

$$\lim_{x\to 1^+} f'(x) = \frac{1}{2} \qquad \lim_{x\to 1^-} f'(x) = -\frac{7}{2}$$

$$\Downarrow$$

f IS NOT DIFF. IN 1

$$\lim_{x\to -1^+} f'(x) = -\frac{7}{2} \qquad \lim_{x\to -1^-} f'(x) = \frac{1}{2}$$

$$\Downarrow$$

f IS **NOT** DIFF. IN -1

SIGN OF $f'(x)$

$|x|>1 \quad f'(x)>0$ THAT IS $-\frac{3}{2}x^2+2x>0$

$x\left(-\frac{3}{2}x+2\right)$

$0 \qquad 4/3$

$- \mid + \mid -$

CONSIDERING ONLY $|x|>1$ $\quad f'(x)<0$

$|x|<1 \quad f'(x)>0 \quad -\frac{3}{2}x^2-2x>0$

$x\left(-\frac{3}{2}x-2\right)>0$

$(-1,0) \quad f'(x)<0$

$$\lim_{x\to 1} \frac{e^{(x-1)^2} - 1 - (x-1)^2}{\left(\sin\left(2(x-1)^2\right)\right)^2}$$

CHANGE OF VARIABLE

$y = x-1 \qquad x \to 1 \Rightarrow y \to 0$

$$\lim_{y\to 0} \frac{e^{y^2} - 1 - y^2}{\left(\sin(2y^2)\right)^2}$$

CHANGE OF VARIABLE

$z = y^2 \qquad y \to 0 \quad z \to 0^+$

$$\lim_{z\to 0^+} \frac{e^{z} - 1 - z}{\left(\sin(2z)\right)^2}$$

$z \to 0^+$

$\to 1$

$$\lim_{z\to 0^+} \frac{(e^{z} - 1 - z)\,(2z)^2}{\left(\sin(2z)\right)^2\,(4z^2)}$$

$$\lim_{z\to 0^+} \frac{e^{z} - 1 - z}{2z^2} \quad \left[\frac{0}{0}\right] \text{ HOPITIL}$$

$$\lim_{z\to 0} \frac{e^{z} - 1}{8z} \quad \left[\frac{0}{0}\right]$$

HOPITAL

$$\lim_{z\to 0} \frac{e^{z}}{8} = \frac{1}{8}$$