Warm up:

$(-\infty, 8) \cup (8, \infty)$. All $\mathbb{R}$ s.t. $x \neq 8$. $x \neq 8$

What is the domain of the following function?

$$f(x) = \frac{x^2 - 3x - 40}{x - 8} = \frac{\cancel{(x-8)}(x+5)}{\cancel{x-8}} = x + 5$$

$$\frac{0}{0} = \begin{matrix} 0 \; ? \\ 1 \; ? \end{matrix}$$

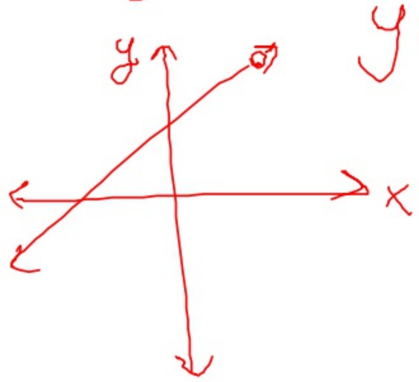
indeterminate

$\{x \mid x \neq 8\}$

What does the graph of this function look like? Can you figure it out without using a calculator?

$(x<8)$ $x>8$ or $x<8$.

$y = f(x)$



Notes:

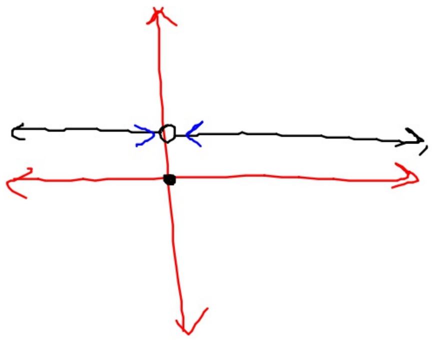
$y = 1$

Consider the function $f(x) = \begin{cases} 1, & x \neq 0 \\ 0, & x = 0 \end{cases}$

argument

1. Graph the function
2. Evaluate f(0), f(1), f(2), f(-1) and f(-2)

   $=0 \quad =1 \quad =1 \quad =1 \quad =1$
3. Evaluate the limit: $\lim_{x \to 0} f(x) = 1$ ✓



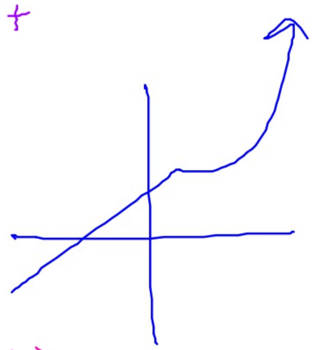
$$\lim_{x \to 0^-} 1 = 1$$

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

A limit does not exist (d.n.e.)

if: $\lim_{x\to c^-} f(x) \neq \lim_{x\to c^+} f(x)$

ex/ $f(x) = \begin{cases} 3x+2, & x \le 2 \\ x^2-5, & x > 2 \end{cases}$



$\lim_{x\to 2} f(x) = \boxed{?}$ d.n.e.

$\lim_{x\to 2^-} 3x+2 = 8$

$\neq$

$\lim_{x\to 2^+} x^2-5 = -1$

$\lim_{x\to 2^-} f(x) = 8$

One-sided limit

Consider the function $f(t) = \dfrac{|t|}{t} = \dfrac{|-0.5|}{-0.5} = \dfrac{0.5}{-0.5} = -1$

- Domain? $(-\infty, 0) \cup (0, \infty)$
- Continuous or discontinuous?
- $\lim\limits_{t \to 0^-} f(t) = -1$

$\lim\limits_{t \to 0+} f(t) = 1$

$\lim\limits_{t \to 0} f(t) =$ d.n.e.