Q: What is $\sqrt{4}$? 2

Q: What is $\sqrt{5}$? Uh...

about 2

Fns like this are cts.

if a close to b

then $f(a)$ close to $f(b)$

What is $(3.1251)^3 \approx 27$

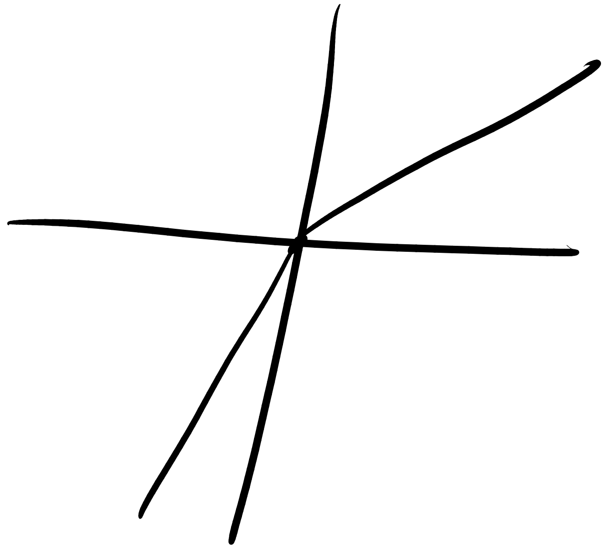
real A: 30.52...

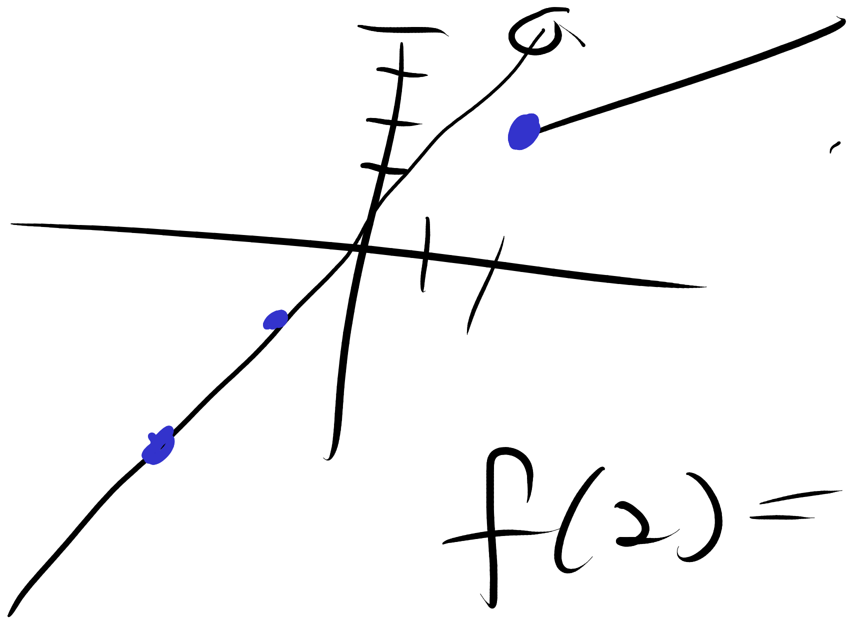
What is $\sqrt[3]{28} \approx 3$

real A: 3.0365...

$$f_1(x) = \begin{cases} x & x \geq 0 \\ 2x & x < 0 \end{cases}$$

$$f_2(x) = \begin{cases} x & x \geq 2 \\ 2x & x < 2 \end{cases}$$





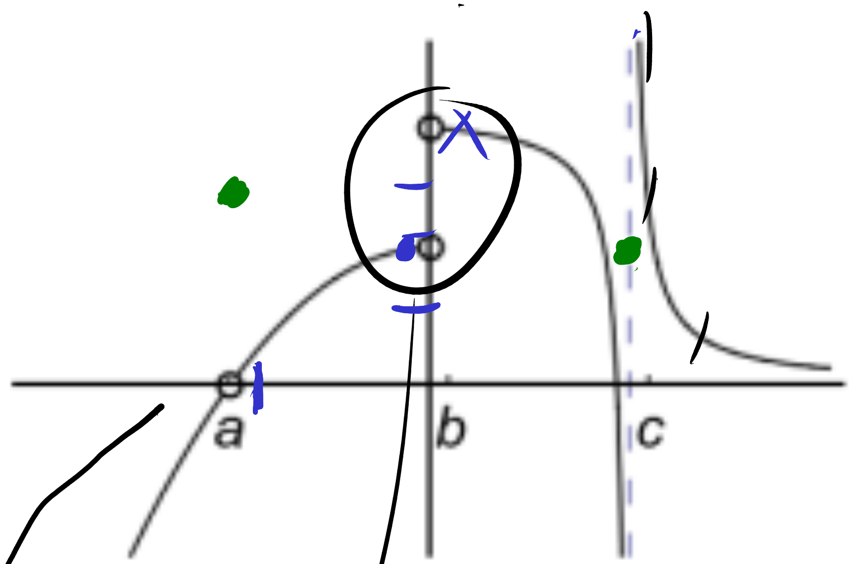
$f(2) = 2$

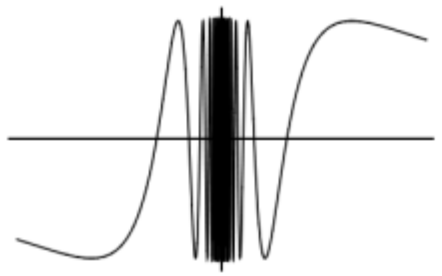
$f(1.9) = 3.8 \neq 2$

$f(1.9999) = 3.9998$

$\neq 2$

different things that can happen.





hole

removable discontinuity

jump

Can't say $f(c) = \infty$ b/c ∞ not a number

$f(c+.0001) \approx \infty$

$= 9$

$= 999$??

$= 9^{99}$

$f(c)$ DNE

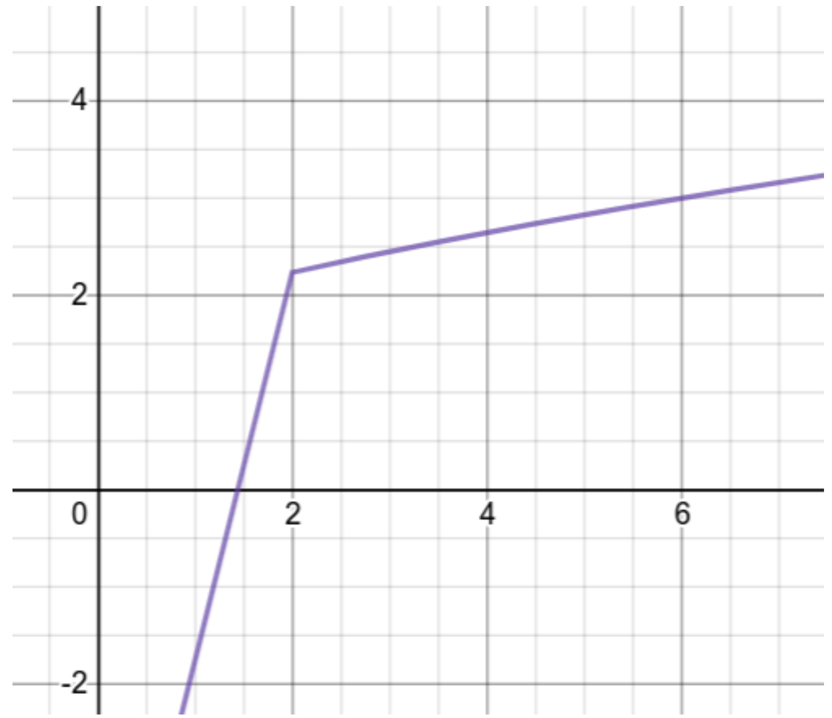
$f(c+.0001)$ exists

c not in $\mathrm{dom}(f)$

1) $g(x) = \begin{cases} \sqrt{x+3} & x \geq 2 \\ 4x+b & x \leq 2 \end{cases}$ wait $b=-6$

for what b is this cts?

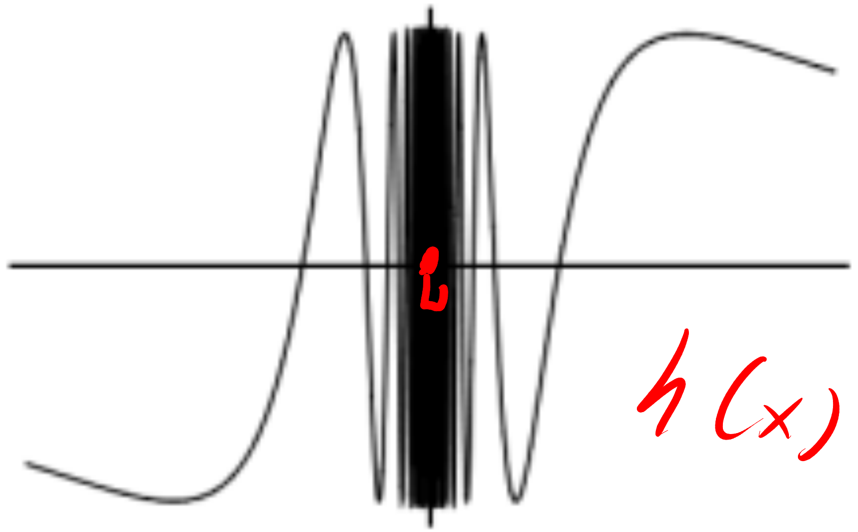
$g(2) = \sqrt{5}$ $\quad b = \sqrt{5} - 8$



2) $h(x) = \begin{cases} \sin\left(\frac{1}{x}\right) & x \neq 0 \\ c & x = 0 \end{cases}$

Can I pick c

so h is cts



in $[-.0001, .0001]$

in $[-.0000001, .0000001]$

$h(x)$ in $[-1, 1]$

limits

Dfn: $\lim_{x \to a} f(x) = L$

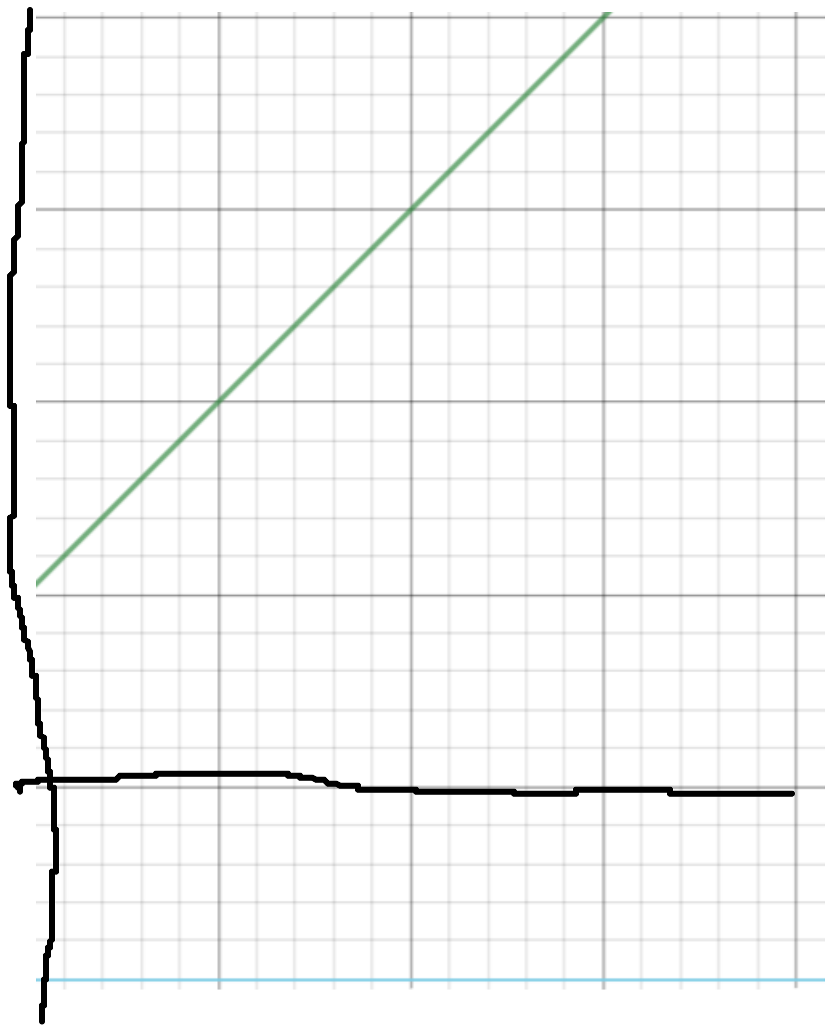
if

$f(x)$ gets as close to L as we want when x is close enough to a.

$$\lim_{x \to 1} x+1$$

b/c cts,

$$\lim_{x \to 1} f(x) = f(1)$$
$$= 2$$



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

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

$$f \neq g$$

$$\text{DNE} = f(1) \neq g(1) = 2$$

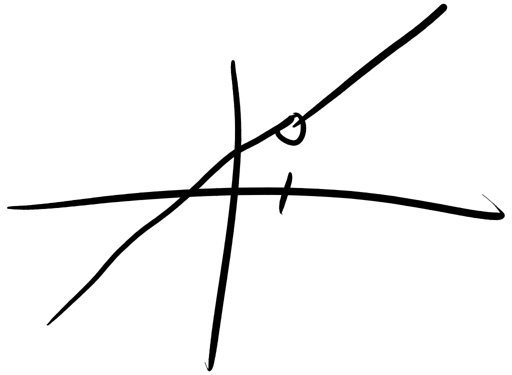
$$\lim_{x\to 1} \frac{(x+1)(x-1)}{x-1} = \lim_{x\to 1} x+1$$

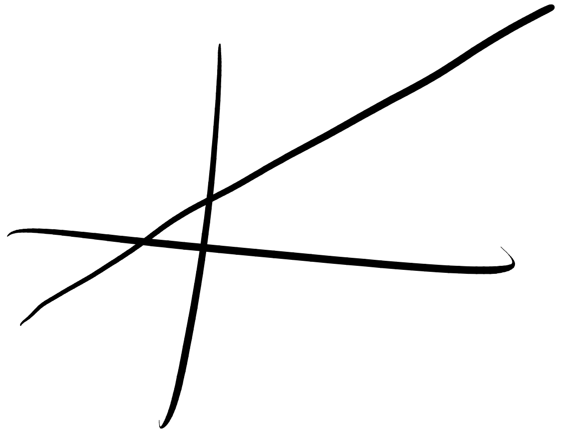
$f(x) = g(x)$ for x near 1

$$f(1) = \frac{0}{0} \; ?$$

$$g(1) = 2$$

$$\lim_{x\to 1} f(x) = \lim_{x\to 1} g(x) = 2$$





what should happen at 1

$$\text{Speed} = \frac{\text{distance}}{\text{time}} \qquad \frac{f(1) - f(0)}{1} \begin{array}{l} \leftarrow \text{miles} \\ \leftarrow \text{hours} \end{array}$$

speed 'at' noon? $\frac{f(0) - f(0)}{0 - 0}$

$$\frac{f(.001) - f(0)}{.001 - 0}$$

$$\lim_{x \to 0} \frac{f(x) - f(0)}{x - 0}$$