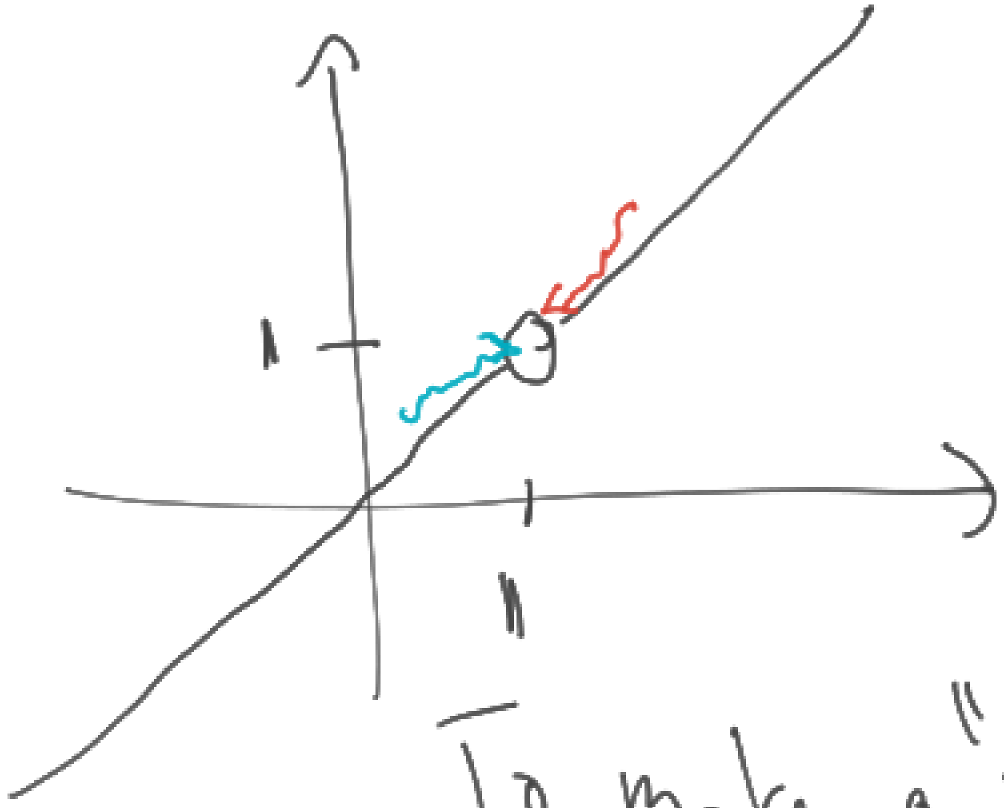
Limits

$f(x) = x, \quad x \neq 1$

$y = x, \quad x \neq 1$



$f(1)$ DNE

To make a "nice" fn, it would be nice if $f(1)$ was 1.

(complete limit)

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

since both one-sided limits are equal to 1.

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

left-sided limit

$$\boxed{\lim_{x \to 1^+} f(x) = 1}$$

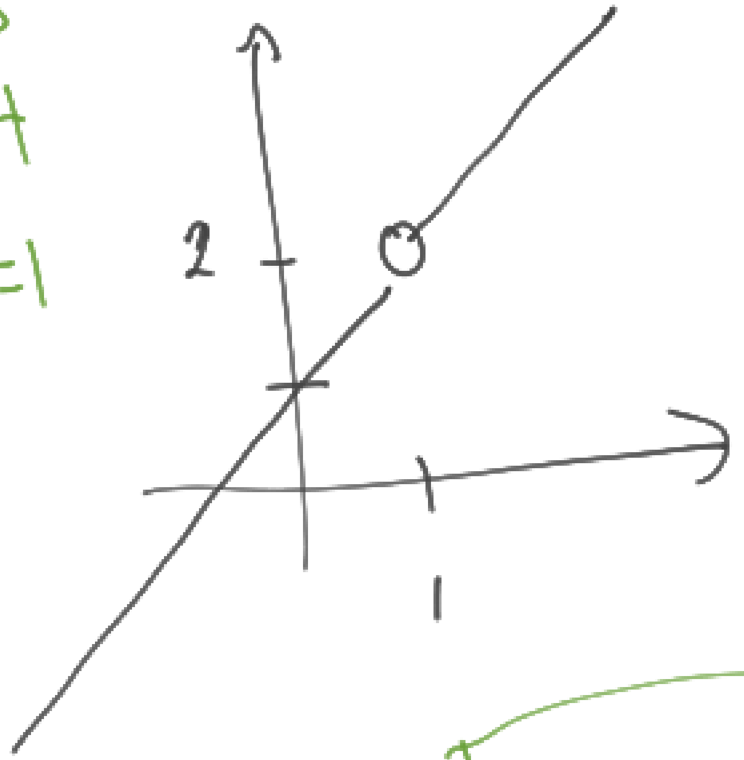
right-sided limit

Ex: $y = \boxed{\frac{x^2-1}{x-1}} = \frac{(x-1)(x+1)}{x-1} = \frac{\cancel{(x-1)}}{\cancel{(x-1)}}(x+1) = \boxed{x+1,\ x-1 \neq 0}$

$\boxed{x+1,\ x \neq 1}$

cannot divide by zero

cts everywhere except at $x=1$



$y(1)$ DNE

but $\lim_{x \to 1} y = 2$

Continuous means "you don't have to let go of your pen"

Consider $\underbrace{\lim_{x \to 1}}_{\text{close to 1 (but not at 1)}} \frac{x^2-1}{x-1} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x+1)}{\cancel{(x-1)}} = \lim_{x \to 1} (x+1) = 1+1 = 2$

denom $\neq 0$

close to zero