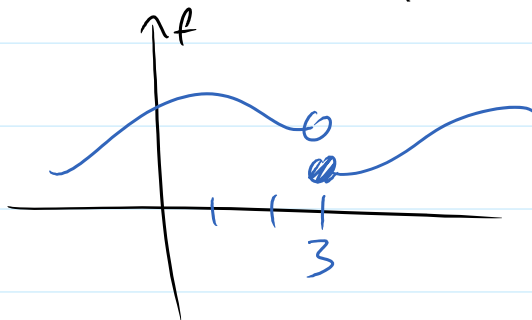


A function  $f(x)$  is continuous at  $x=c$ , if:

$$f(c) = \lim_{x \rightarrow c} f(x) = \lim_{x \rightarrow c^-} f(x) = \lim_{x \rightarrow c^+} f(x)$$



$f$  is discontinuous at  $x=3$

$f$  is continuous on  $(-\infty, 3) \cup (3, \infty)$

Is  $g(x) = \frac{x^2 - 2x + 1}{x - 1}$  continuous everywhere?

$g(1) \text{ DNE} \}$   $g$  is not continuous at  $x=1$ .

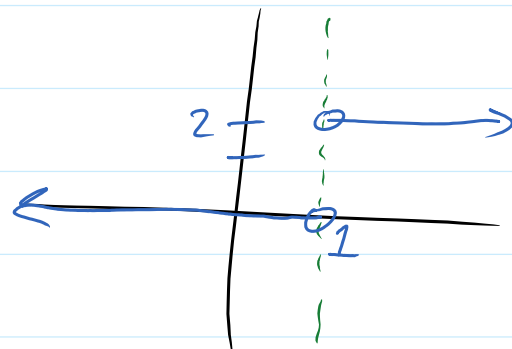
$$f(x) = \begin{cases} 3, & x \leq 0 \\ ax^2 + a, & x > 0 \end{cases}$$

$$\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^+} f(x)$$

$$3 = a \cdot 0^2 + a$$

$$\boxed{3 = a}$$

$$g(x) = \begin{cases} 0, & x < 1 \\ 2, & x > 1 \\ ax-2, & x = 1 \end{cases}$$



$g$  is not continuous at

$$x=1 \text{ b/c } \lim_{x \rightarrow 1^-} g(x) = 0 \neq 2 = \lim_{x \rightarrow 1^+} g(x)$$

$$y = \frac{x}{x^2 - 7} \quad \text{Find } y'$$

$$\frac{dy}{dx} = y' = \frac{(x^2 - 7) \cdot (x)' - x(x^2 - 7)'}{(x^2 - 7)^2} = \frac{x^2 - 7 - x(2x)}{(x^2 - 7)^2}$$

$$= \frac{x^2 - 7 - 2x^2}{(x^2 - 7)^2} = \boxed{\frac{-x^2 - 7}{(x^2 - 7)^2}} = \boxed{\frac{-(x^2 + 7)}{(x^2 - 7)^2}}$$