Warm up.

Solve for all x such that $\frac{x}{x-1} \geq 3$.

① $x-1>0$, $x>1$

$x \geq 3(x-1)$

$x \geq 3x-3$

$3 \geq 2x$

$x \leq \frac{3}{2}$

$1 < x \leq \frac{3}{2}$

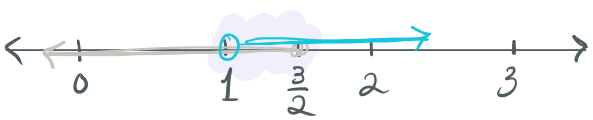
② $x-1<0$, $x<1$

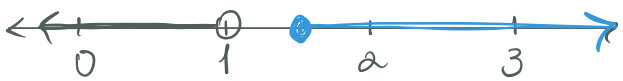
$x \leq 3(x-1)$

$x \leq 3x-3$ no x.

$3 \leq 2x$

$x \geq \frac{3}{2}$





$1 < x \leq \frac{3}{2}$,

set notation: $\{x : 1 < x \leq \frac{3}{2}\}$

"the set of" "such that"

interval notation: $(1, \frac{3}{2}]$

$\{x : a<x<b\} \Leftrightarrow (a,b)$ open

$\{x : a \leq x \leq b\} \Leftrightarrow [a,b]$ closed

$\{x : a \leq x < b\} \Leftrightarrow [a,b)$ half closed half open

always use open bracket w/ ∞

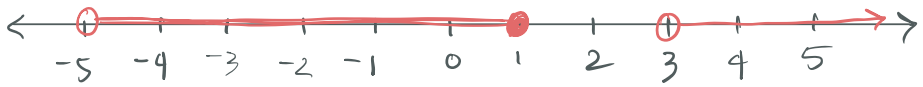
$\{x : x > a\} \Leftrightarrow (a, \infty)$

$\{x : x \geq a\} \Leftrightarrow [a, \infty)$

$\{x : x < b\} \Leftrightarrow (-\infty, b)$

$\{x : x \leq b\} \Leftrightarrow (-\infty, b]$

Ex. $\{x : x > 3 \text{ or } -5 < x \leq 1\}$



$(3, \infty) \cup (-5, 1]$

↖ Union. $A \cup B$, the set of all objects that are contained in either A or B.

Ex. $|x-1| < 10$ (solve for all x)

$-10 < x - 1 < 10$ (*)

$+1 \quad +1 \quad +1$

$-9 < x < 11$ $\quad (-9, 11)$

$|x-1| = 10$

↙ $x - 1 = 10$ ↘ $x - 1 = -10$

$>$

$x - 1 > -10$ & $x - 1 < 10$

Ex $|2x+1| \geq 5$

$2x+1 \geq 5$ OR $2x+1 \leq -5$

$2x \geq 4$ $2x \leq -6$

$x \geq 2$ or $x \leq -3$

$|2x+1| = 5$

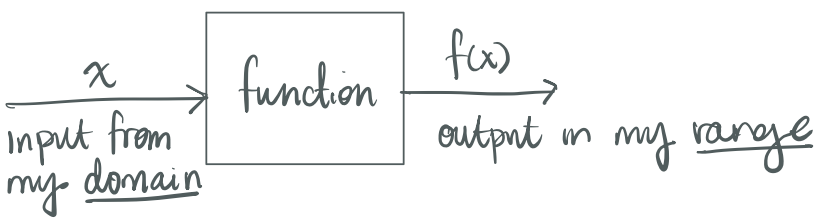
$2x+1 = 5$ $2x+1 = -5$

$x=-3$: $|2(-3)+1| = |-6+1| = 5 \geq 5$

$x=-4$: $|2(-4)+1| = |-8+1| = 7 \geq 5$

$\{x : x \geq 2 \text{ or } x \leq -3\}$ $(-\infty, 3] \cup [2, \infty)$

1.1. Functions.



$f(x)$: function f, input x

$g(t)$: function g, input t

Ex. $f(x) = x^2$

↑ what the function does

$f(3) = 3^2 = 9$ $f(t+1) = (t+1)^2 = t^2+2t+1$

$f(-\frac{1}{2}) = \frac{1}{4}$

Ex $h(t) = t^2 - 1$

$h(-5) = 24$ $\qquad e, \pi$

$h(\pi) = \pi^2 - 1$

$h(\sqrt{x-1}) = (\sqrt{x-1})^2 - 1$

$= x - 1 - 1 = x - 2$

Domain is the set of all numbers that we use as an input.

A lot of times the domain is not given.

If domain is not specified, then the domain is the set of all real numbers for which the formula makes sense and produces a real number. (R)

$f(0) = \frac{1}{0}$ ↯

Ex. $f(x) = \frac{1}{x}$ What is the domain of f?

The domain is all real #s except $x = 0$.

$(-\infty, 0) \cup (0, \infty)$