Lecture 08/31/23 <u>Domain and Range</u>

<u>Interval Notation</u>: When describing domain and range it is ~~convinter~~ convinent to have a short hand for describing large sets of numbers.

$[a,b] \longleftrightarrow a \leq x \leq b$

$(a,b] \longleftrightarrow a < x \leq b$

$[a,b) \longleftrightarrow a \leq x < b$

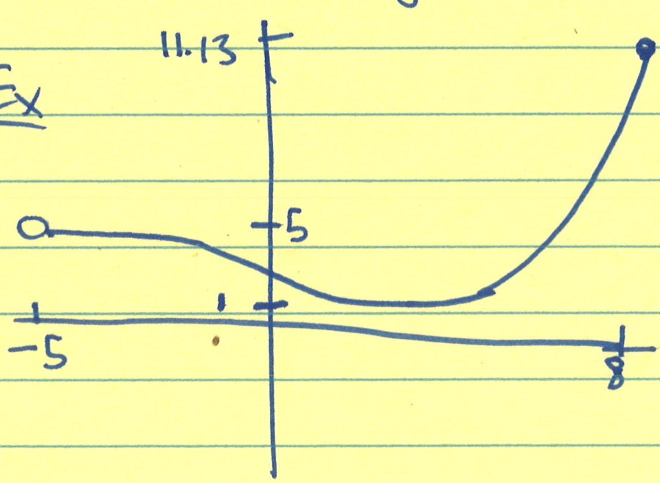
$(a,b) \longleftrightarrow a < x < b$

<u>Recall</u>: The <u>domain</u> of a function is the set of all x-values that are allowed to go into the function. The <u>range</u> of a function is the set of all y-values that are allowed to go into the function.

<u>Ex:</u>

<u>Domain + Range from Graphs</u>:

<u>Ex</u>



D: $[-5, 8]$

R: $[1, 11.13]$

Domain + Range from equations

Ex: Find domain and range of

$$g(x) = \frac{1}{\sqrt{x^2-25}}$$

We can't plug negative #s into square root, so we need to see when ~~the denominator is positive~~ x^2-25 is positive. This is the same thing as seeing when

$$x^2-25 \geq 0$$

$$\Updownarrow$$

$$x^2 \geq 25$$

$$\Updownarrow$$

$$-5 \geq x \quad \text{or} \quad x \geq 5$$

$$\Updownarrow \qquad\qquad \Updownarrow$$

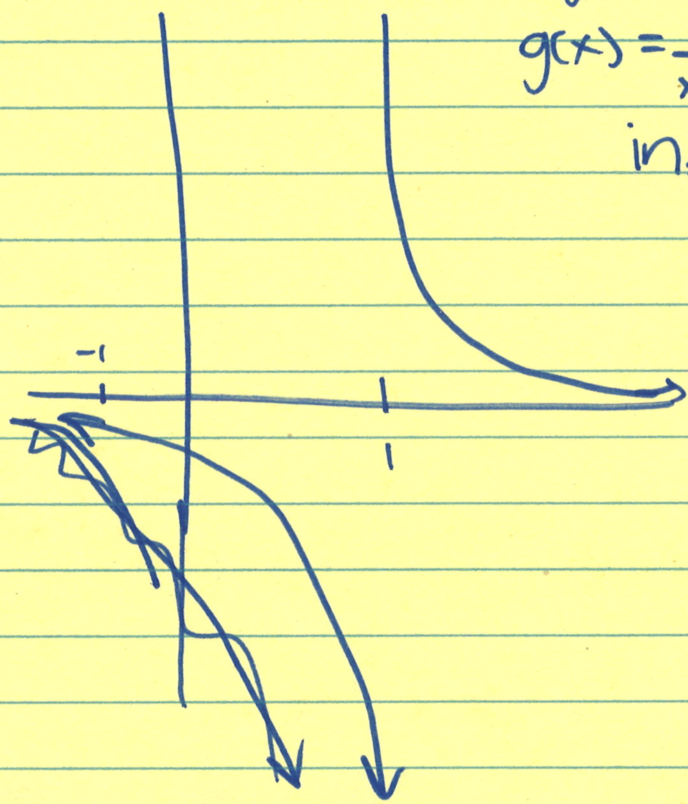
$$(-\infty, -5] \qquad\qquad [5, \infty)$$

The denominator can't be zero. This happen when $x = -5, 5$ so we must remove 5 and -5 from above. Hence domain is $(-\infty,-5] \cup [5,\infty)$

To find range use a graphing calc. Desmos demonstration.

Restricting Domain: Sometimes we will only look at pieces of a function by shortening the domain.

Ex: Determine the range of the function $g(x) = \frac{1}{x-1}$ on the interval $(-1, 2)$



$g(-1) = \frac{1}{-1-1} = -\frac{1}{2}$. $g(x)$ travels to $-\infty$ as x approaches 1. Then, it comes from ∞ until it hits $g(2) = \frac{1}{2-1} = \frac{1}{2}$ so range is

$$\left(-\infty, -\frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$$