10.2 Domain and Range of Functions

Ex Let P be the function that gives the population of Portland in the year that is input.

$P(2016) = 639863$

$P(1990) = 487849$

$P(1600) = ?$

In the year 1600, what was the population? There was no Portland until ~~1859~~. 1851.

For P, using 1600 for input was not an option. $P(1600)$ is undefined.

Ex Let $g(x) = \dfrac{x}{x-7}$. Is there a bad input?

$g(12) = \dfrac{12}{12-7}$

$= \dfrac{12}{5} = 2.4$

But $g(7)$... would lead to

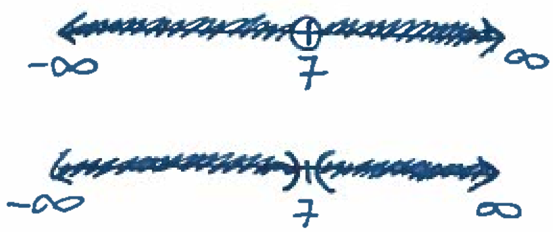
$g(7) = \dfrac{7}{7-7}$

$= \dfrac{7}{0}$ division by 0 is undefined

another unallowed input

~~10.3 Lots of on-screen demos~~

The <u>domain</u> of a function is the collection of all its valid inputs.

Function	Domain: Visually	Domain: Interval Notation
p		$[1851, \infty)$
g		$(-\infty, 7) \cup (7, \infty)$

An alternative is "set-builder" notation.

With p, the domain is

$$\{x \mid \underbrace{x \geq 1851}_{\text{condition}}\}$$

"such that"

With g, the domain is

$$\{x \mid x \neq 7\}$$

$\underline{Ex}$ H, where $H(x) = \dfrac{2x+1}{x^2-2x-8}$

Find the domain of H.

Looking for good x-values...
Consider what bad ones could be...

We worry about
$x^2 - 2x - 8 = 0$
(would mean division by 0.)

Solve this equation
- Quadratic Formula
- try to factor...

$$(x-4)(x+2) = 0$$

$$\Longrightarrow \quad x-4=0 \quad \text{or} \quad x+2=0$$

$$x=4 \quad \text{or} \quad x=-2$$

Domain:

In interval notation: $(-\infty,-2) \cup (-2,4) \cup (4,\infty)$

set-builder: $\{x \mid x \neq -2 \text{ and } x \neq 4\}$

$\underline{Ex}$

$$Q(x) = \sqrt{7-x} + 3$$

Find Q's domain.

Now worry about a negative number under the $\sqrt{\ }$.

We $\underline{\text{want}}$

$$7 - x \geq 0$$

$$-x \geq -7$$

$$x \leq 7$$

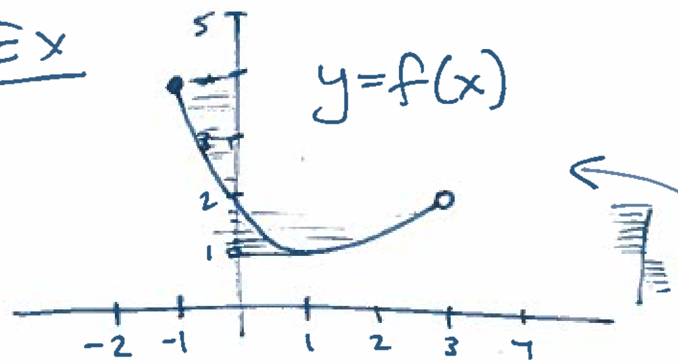
good x-values...

$(-\infty, 7]$

Also, the range of a function is the collection of its output values.

With range, only having MTH 95 skills, finding range is too hard if you only use the formula.

Ex

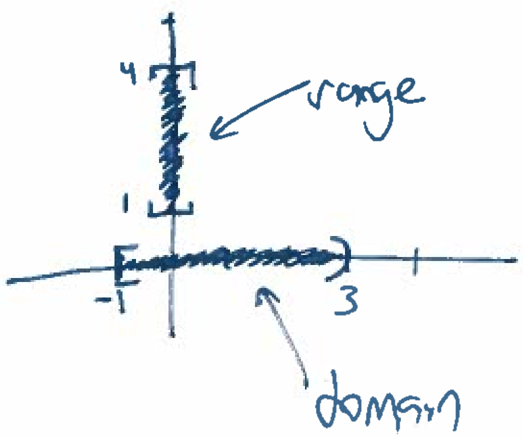


f's domain is....

$[-1, 3)$

f's range is

$[1, 4]$.



With tables...

If all I know about k is:

x	$k(x)$
3	4
8	5
10	5

domain is just these..

write $\{3, 8, 10\}$

And range is $\{4, 5\}$