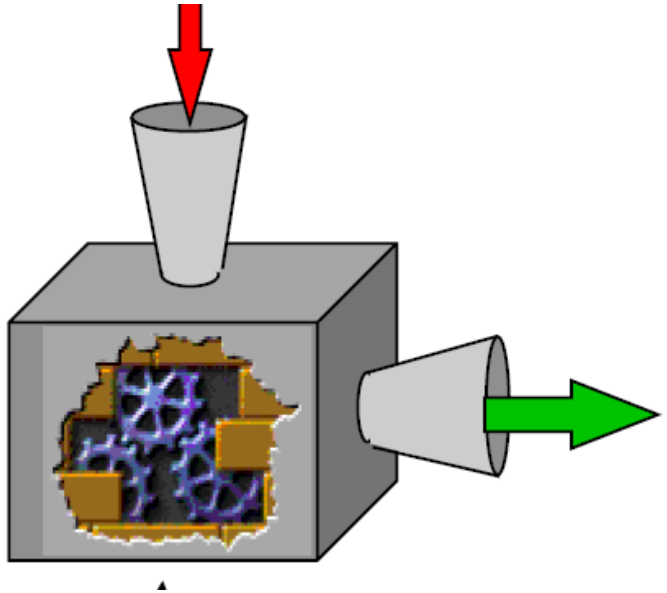
Functions and their Representations

Domain and Range

Domain and Range

Domain (input)

x value



Range (output)

y = f(x)

The **domain** is the set of all inputs (independent variable and often x values)

The **range** is the set of all outputs (dependent variable and often y values)

For each function: What are the possible inputs and outputs (in words)? State the domain and range.

a) Let *l* be the function that converts feet to inches.

Inputs:_____ Outputs:_____

Domain:_____ Range:_____

b) Temperature readings for Portland, OR, on October 10, 2012, are given in Table 1.
Let $f(t)$ be the temperature in degrees Fahrenheit and let t be hours after midnight.

Table 1

t (hours after midnight)	1	2	3	4	5	6	7	8	9	10	11	12
f(t) (temperature in ◦F)	51	49	47	47	45	46	48	46	47	48	49	51

Inputs:_____ Outputs:_____

Domain:_____ Range:_____

c) The function f where $f(x) = -7x + 3$.

Inputs:_____ Outputs:_____

Domain:_____ Range:_____

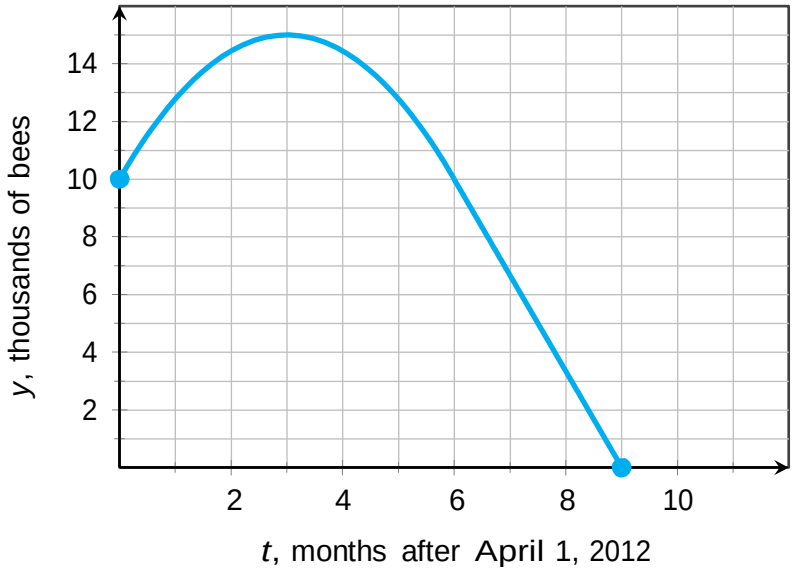
d) The function given by the set of ordered pairs $\{(5, 4), (3, 6), (-2, 1), (7, 4), (1, -5)\}$

Inputs:_____ Outputs:_____

Domain:_____ Range:_____

Example: A population of bees was happily residing in someone's backyard. Let $B(t)$ be the size of the bee population (in thousands) t months after April 1, 2012, which is shown in Figure 1 below.

Figure 1. Graph of $y = B(t)$



State the domain and range:

a) In words:

b) In interval notation:

Domain:_____ Range:_____

c) In set-builder notation:

Domain:_____ Range:_____

Example: Since a full tank of gas was purchased, Susy has driven 60 miles and there are 16 gallons left in the tank. After driving 150 miles since filling up, there are 10 gallons left.

a) Assuming the car uses gas at a constant rate, find a function to model the amount of gas in the tank (in gallons). Let the independent variable be the number of miles driven since a full tank of gas was purchased.

b) The domain of the function in this context is _____.

c) The range of the function in this context is _____.

Example: Bob plans to build a fenced garden where one side of the pen will be the side of his house. For the other three sides, he has 60 feet of fence to use.

a) Find a function to model the area of the rectangular pen with respect to the width (the two sides perpendicular to the house).

b) Find the dimensions of the pen such that you can enclose the maximum area.

c) The function's domain is _____

d) The function's range is _____

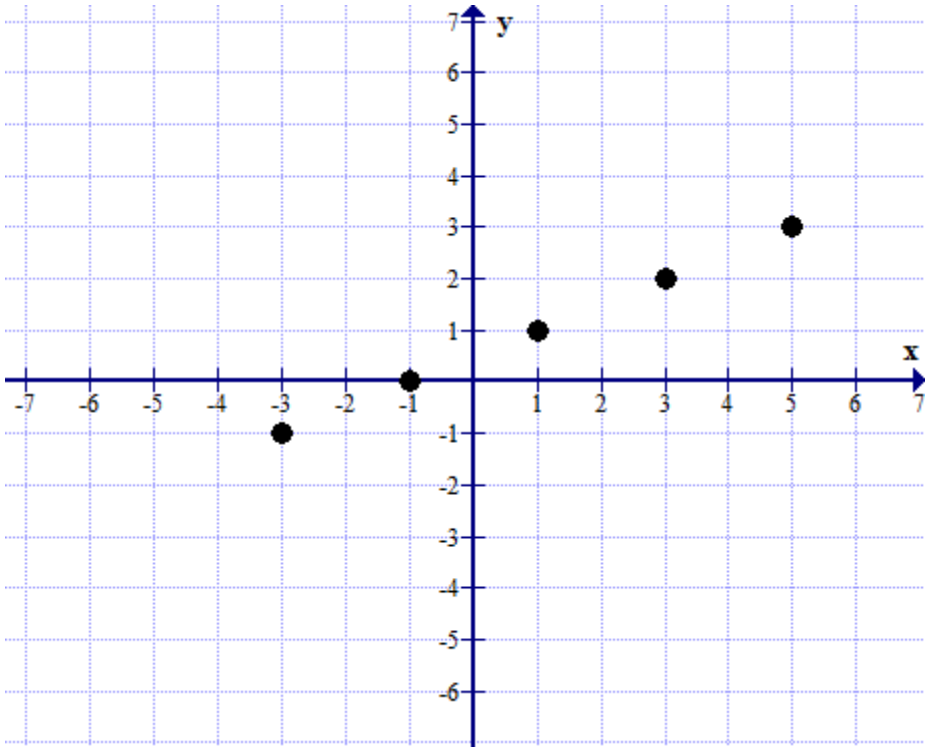
Example: For the following graph of $f(x)$, determine:

a) $f(-1)$

b) The domain

c) Any x-values for which $f(x) = 2$

d) The range



The graph of $y = f(x)$

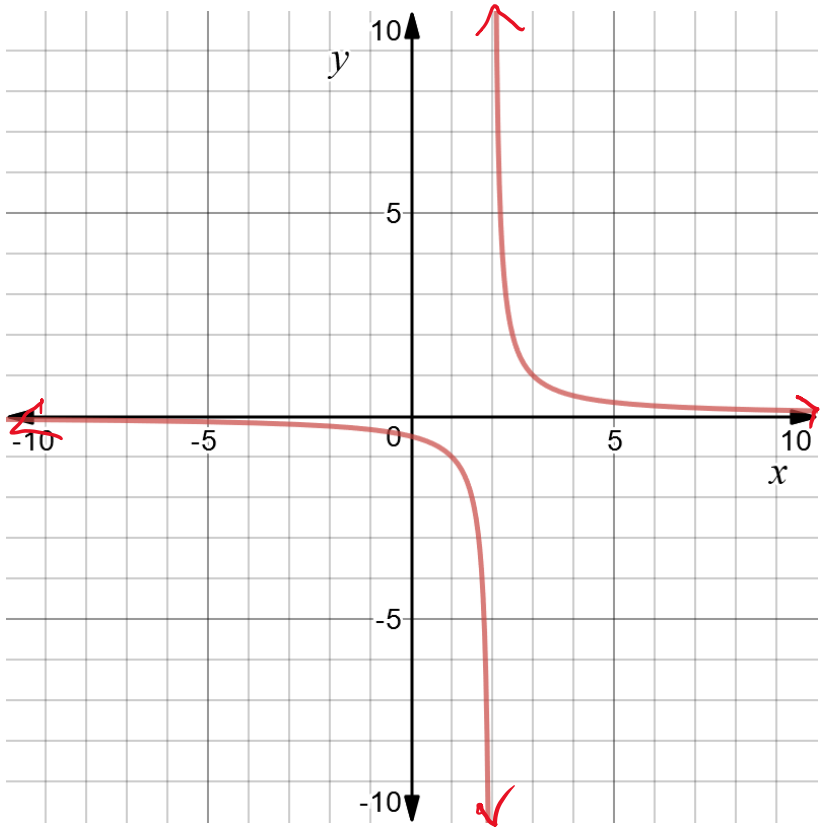
Example: For the following graph of a function, $h(x)$, state the domain and range using both interval and set notation.

The domain in set-builder notation is _____

The domain in interval notation is _____

The range in set-builder notation is _____

The range in interval notation is _____



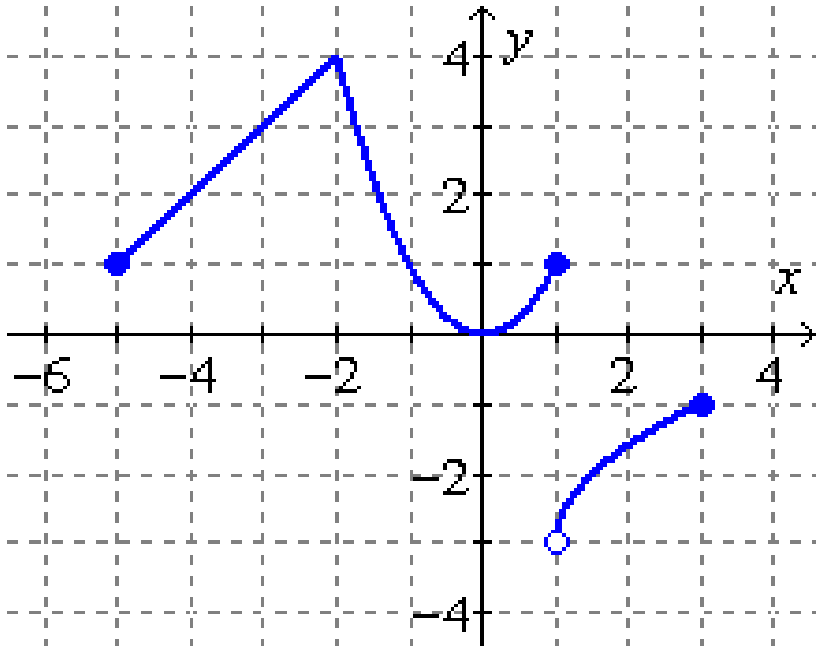
The graph of $y = h(x)$

Example: For the following graph of p(x), determine:

a) Find p(1)

b) State the domain in interval notation.

c) State the range in interval notation.



The graph of y = p(x)

Finding Domain

The largest possible set for each the domain and range is the set of all real numbers. So far, there are two primary possible circumstances that restrict the domain of a function. When a number causes either of the following to occur, it *must* be excluded from the domain of a function:

- Division by zero

- The square root (or any even root) of a negative number

Finding Domain

Finding the domain of a function defined by an equation:

1. Start with the domain as the set of real numbers.
2. If the equation has a denominator, set the denominator equal to zero and solve. Exclude any numbers that make the denominator zero.
3. If the equation has a radical of even root, set the radicand greater than or equal to zero. Include in the domain all numbers that cause the expression inside the radical to be greater than or equal to zero.

Example: Find the domain of the following functions and state it in interval and set builder notation.

$a)\quad f(x)=3x+2$

Domain in interval notation:_____
Domain in set-builder notation: _____

$b)\quad g(x)=\dfrac{x}{x+1}$

Domain in interval notation:_____
Domain in set-builder notation: _____

$c)\quad h(x)=\dfrac{x}{x^2-16}$

Domain in interval notation:_____
Domain in set-builder notation: _____

$d)\quad j(x)=\sqrt{2-x}$

Domain in interval notation:_____
Domain in set-builder notation: _____

Example: Find the domain of the following functions and state it in interval and set builder notation.

$a)\ \ q(x)=\dfrac{2}{\sqrt{x+9}}$

$b)\quad r(x)=\dfrac{\sqrt{x-3}}{8-x}$

Domain in interval notation:_____
Domain in set-builder notation: _____

Domain in interval notation:_____
Domain in set-builder notation: _____