SM 3H **Date:** **Section:**

Objective:

Graphing Piecewise-Defined Functions
Sometimes a function is defined differently on different parts of its domain. When functions are defined by more than one equation, they are called ***piecewise-defined functions*.**

Remember how to graph:
Line **Quadratic** **Square root**

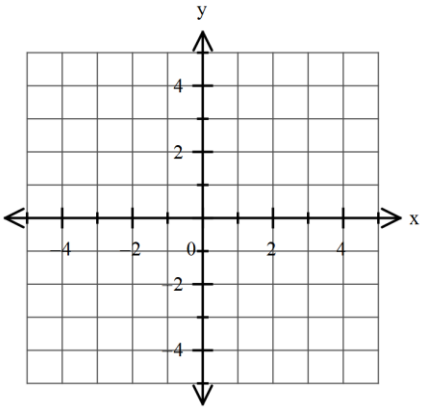
Here is how to write a piecewise function.

$$f(x)=\begin{cases} x & if\ x<0 \\ 3 & if\ x\geq 0 \end{cases}$$ This means:

When you graph a piecewise function, think of the points where the graph changes to the second function as a fence. If you have _____or____ the function does NOT live on the fence. If you have _____or_____ then the function lives on the fence.

EXAMPLE: A) find domain (try to do it without graphing), B) Find the intercept(s), C) Graph the function, D) Find the range.

$$f(x)=\begin{cases} x+1 & if\ x\leq -1 \\ x^2+1 & if\ x>-1 \end{cases}$$



Domain:

Intercept(s):

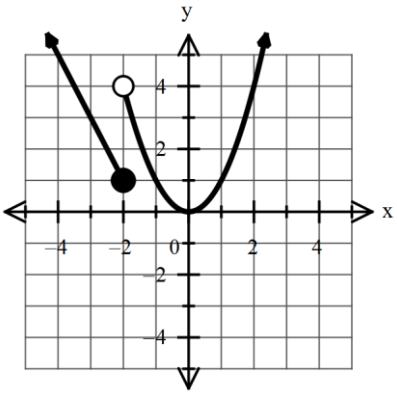
Range:

Sometimes we want to find the value at a given coordinate.
You can do this using a graph.
EX. A) $f(-4)=$

B) $f(-2)=$

C) $f(0)=$

D) $f(1)=$



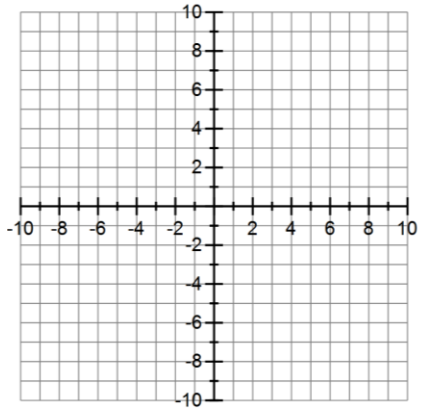
We can also find the value by substituting the given coordinate into the equation.

EX. $f(x) = \begin{cases} 2x & \text{if } x < 1 \\ 1 & \text{if } x = 1 \\ 2x^2 - 4 & \text{if } x > 1 \end{cases}$

A) $f(-10)$ B) $f(-2)$ C) $f(1)$ D) $f(5)$

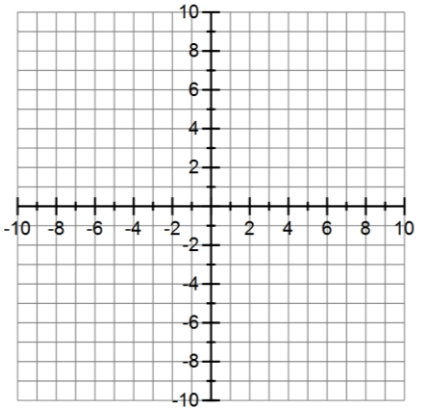
Examples: For the following functions:
a) Graph the function.
b) Find the domain and range of the function.
c) Locate any intercepts.
d) State whether the function is continuous on its domain.

1) $f(x) = \begin{cases} x+3 & \text{if } x \le -1 \\ 2x & \text{if } x > 1 \end{cases}$



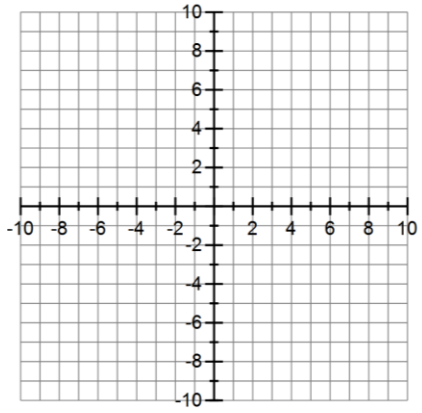
Find: $f(-4)$ $f(0)$ $f(4)$

2) $f(x) = \begin{cases} 2 & \text{if } -4 < x < 0 \\ x^2 + 2 & \text{if } x \ge 0 \end{cases}$



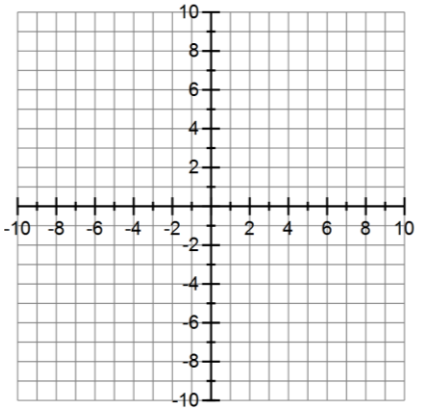
Find: $f(-2)$ $f(0)$ $f(6)$

3) $f(x) = \begin{cases} 3-x & \text{if } -5 \le x < -2 \\ \sqrt{x} & \text{if } 0 < x < 4 \\ 2x-6 & \text{if } x \ge 4 \end{cases}$



Find: $f(-3)$ $f(1)$ $f(8)$

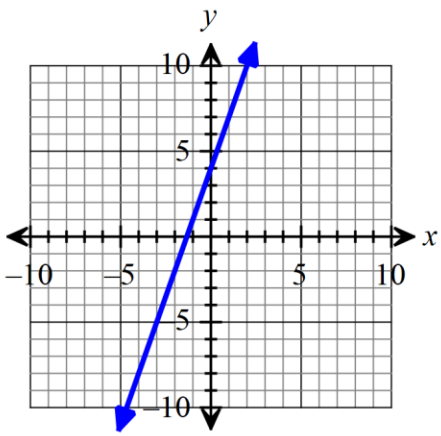
4) $f(x) = \begin{cases} |x| & \text{if } x < 2 \\ 5 & \text{if } x = 2 \\ -\frac{1}{2}x & \text{if } x > 2 \end{cases}$

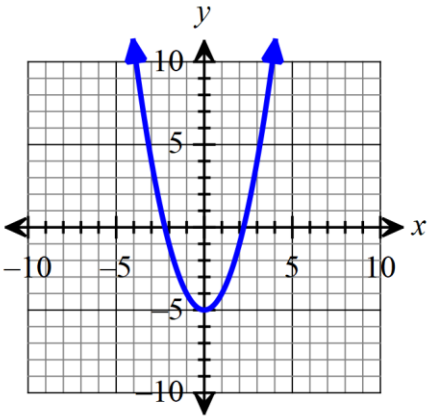


Find: $f(-5)$ $f(2)$ $f-(6)$

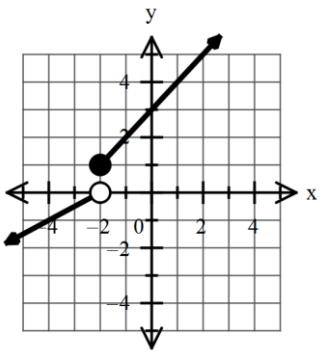
Review:

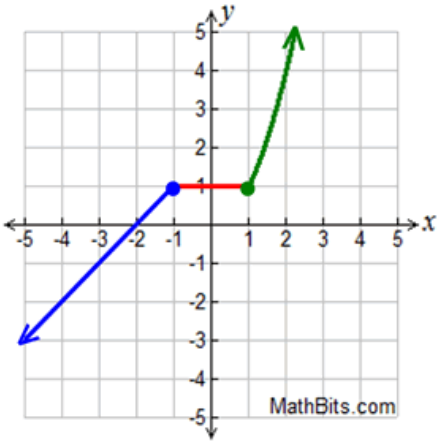
Find the equation of the following graphs.

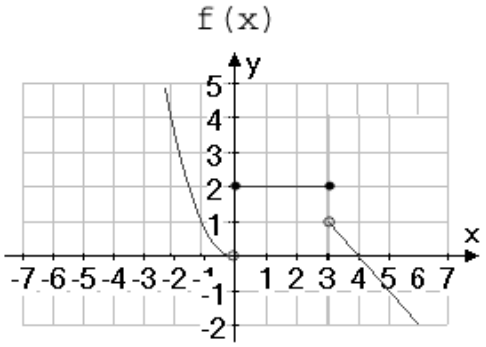


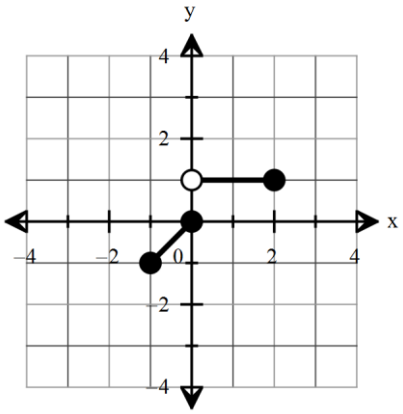


Write a definition (equation) for each piecewise function.









Here is a real -life example for using a piecewise function. Draw a graph.
A doctor's fee is based on the length of time.

A) up to 6 minutes it costs $50
B) over 6 to 15 minutes costs $80
C) over 15 minutes $80 plus $5 per minute above 15 minutes

Write the equation.

How much it would cost at 12 minutes?

How much would it cost for 20 minutes?