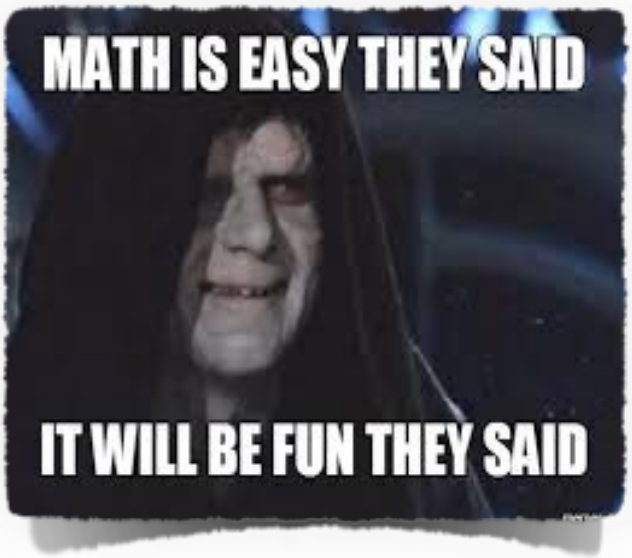


Functions: Episode I

By the end of this lesson, I will be able to answer the following questions…

1. How do I decide if a **relation** is a function?
2. What is **function notation**?
3. How do I find the **domain** of a function algebraically?
4. What are ***difference quotients*** and why are they useful?
5. How do I build function based on a scenario and use technology with the function to make predictions?

Vocabulary

1. Function: Every input has one unique output.

2. Domain: The set of inputs for which the function is defined.

3. Range: The set of possible outputs for a given function

4. Piece-Wise Function: A function that is defined by two or more equations over a specific domain.

5. Difference Quotient: $\frac{f(x+h)-f(x)}{h}, h \neq 0$

Prerequisite Skills with Practice

Evaluate the following function for f(3) and f(-3).

$f(x) = -x^2 + 3x - 3$

Evaluate the following function for f(x+1)

$f(x) = -x^2 + 3x - 3$

Algebraic Challenge: Isolate "y" in the follow equation.

$(x-2)^2 + (y+3)^2 = 25$

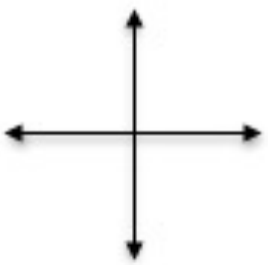
When is a relation a function?

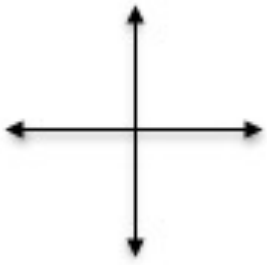
Input	Output
-3	9
-2	4
-1	1
0	0
1	1
2	4

Input	Output
0	0
1	1
1	-1
2	4
2	-4

Vertical Line Test.

Why does it work?





Testing for functions algebraically.

Looking for a ~~sign~~ OR envision the graph…

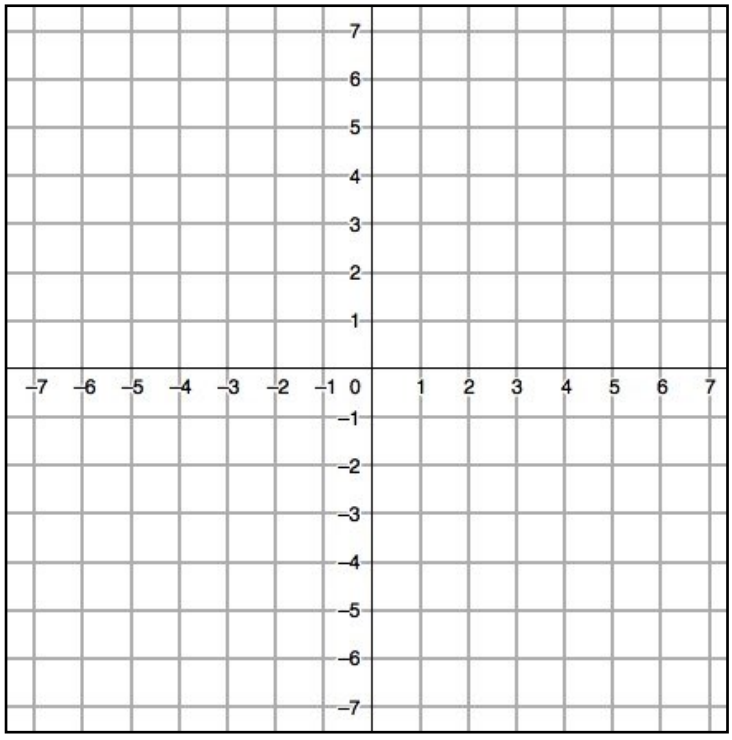
$x^2 + y = 1$ $\quad$ $x + y^2 = 1$ $\quad$ $y = -3$ $\quad$ $x = \frac{4}{3}$ $\quad$ $y = |x|$ $\quad$ $x = |y|$

Piecewise-Defined Function Evaluating.

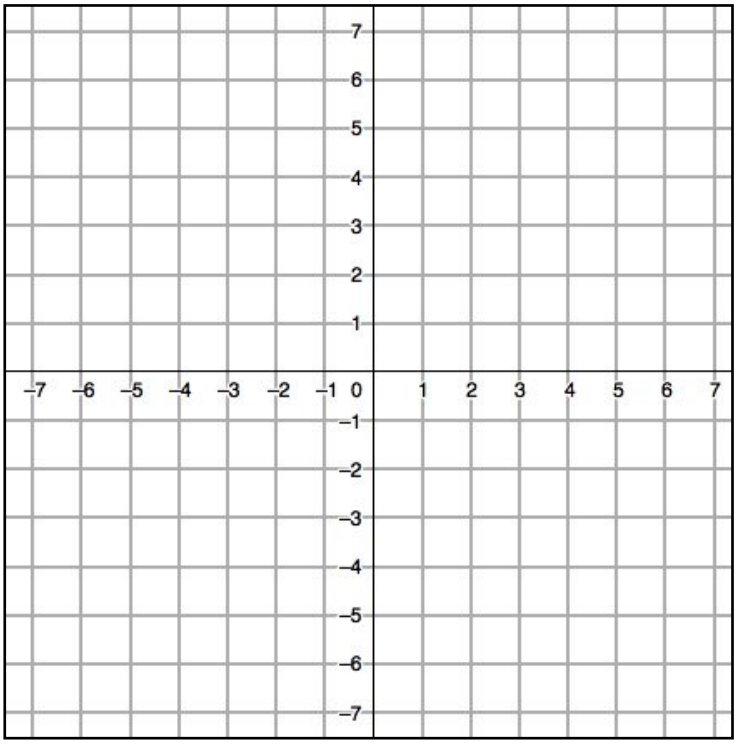
Evaluate f(-2), f(0), f(3) given $f(x) = \begin{cases} 5 - 2x^2, x < 0 \\ 2x + 5, x \geq 0 \end{cases}$

Piecewise-Defined Function Sketching.

Filled in point ● for $\leq$ or $\geq$. Open point ○ for $<$ or $>$



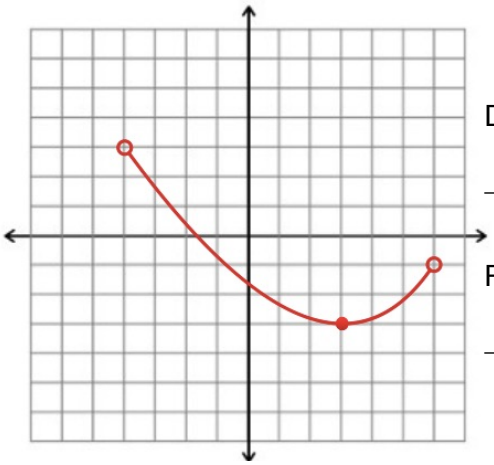
$$f(x) = \begin{cases} -2x + 1, & x < 2 \\ x + 3, & x \geq 2 \end{cases}$$



$$g(x) = \begin{cases} x + 1, & x < -3 \\ 2, & -3 \leq x \leq 0 \\ -x + 3, & x \geq 0 \end{cases}$$

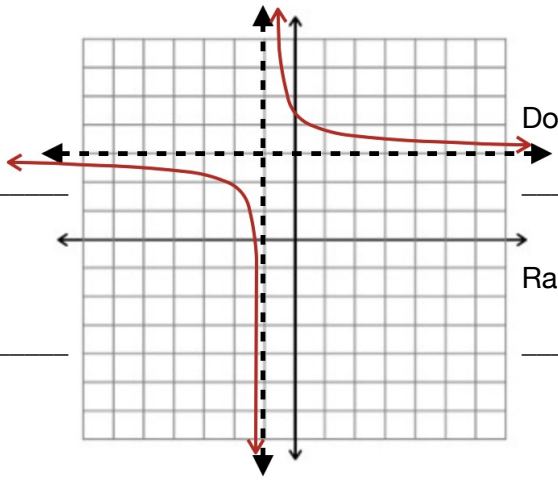
Using Interval Notion to State Domain and Range.

Open Inteval $\rightarrow$ (or) Closed Inteval $\rightarrow$ [or] Union $\rightarrow \cup$



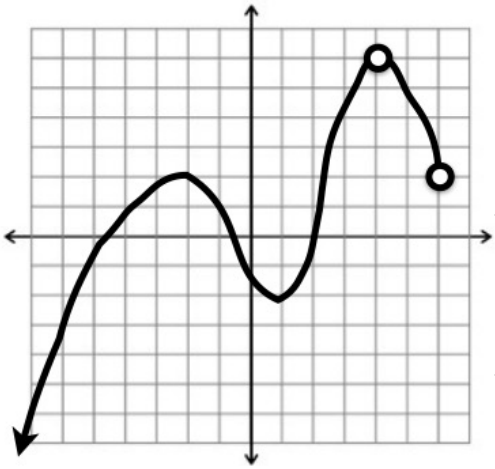
Domain: _____

Range: _____



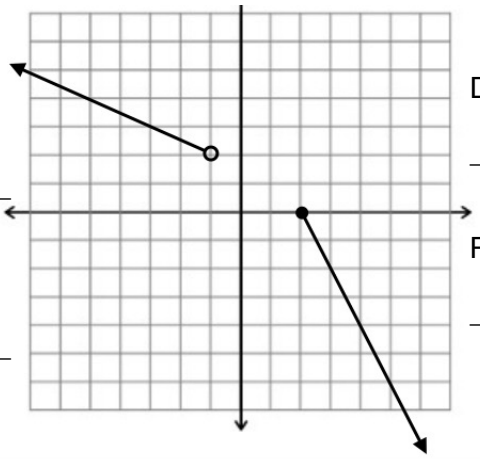
Domain: _____

Range: _____



Domain: _____

Range: _____



Domain: _____

Range: _____

Determining Domains of Functions.

Need to consider the values for which the function is defined and the real world implications of the function.

$f:\{(-3,0),(-1,5),(0,7),(3,5),(6,7)\}$

$k(x)=\sqrt{4-3x}$

$h(x)=\dfrac{1}{x+5}$

$g(x)=-3x^2+4x+5$

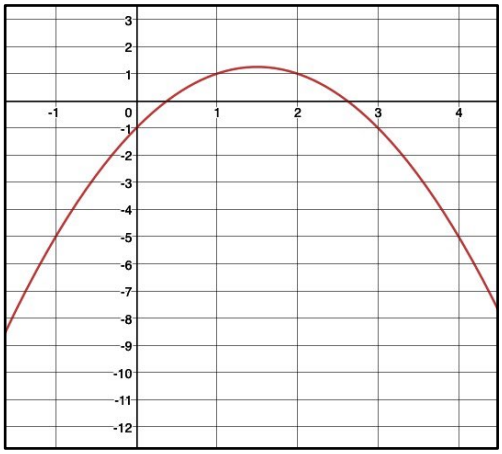
$m(x)=\sqrt{x^2+2x-8}$

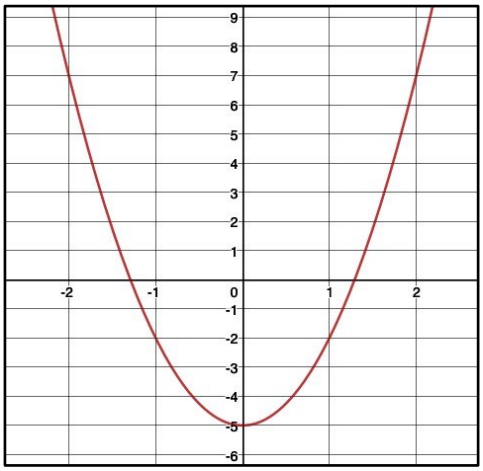
$l(x)=\dfrac{1}{x^2-3x+2}$

The volume of a sphere: $V(r)=\dfrac{4}{3}\pi r^3$

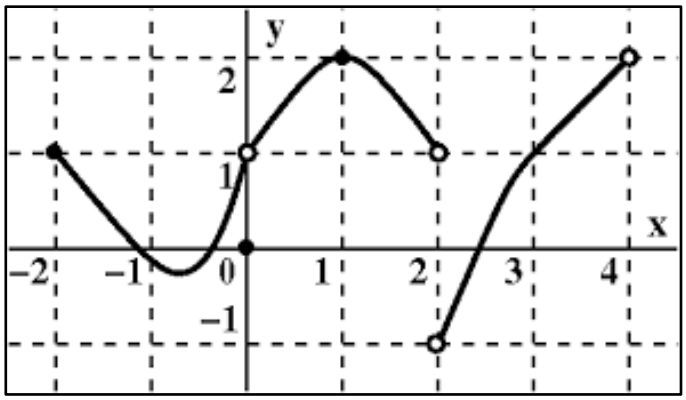
Find the *Difference Quotient* for the functions below and simplify your answer.

$f(x)=-x^2+3x-1$ ← $\frac{f(x+h)-f(x)}{h}, h\neq 0$ Difference Quotient → $f(x)=3x^2-5$





Reading Points from Graphs

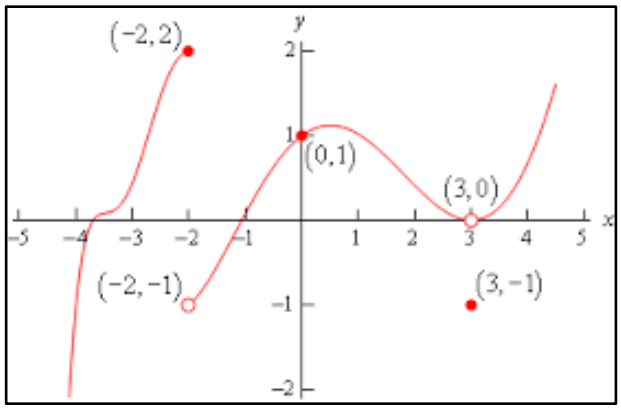


$f(-2)=?$ _____

$f(0)=?$ _____

$f(2)=?$ _____

$f(?)=2$ _____



$f(-2)=?$ _____

$f(0)=?$ _____

$f(3)=?$ _____