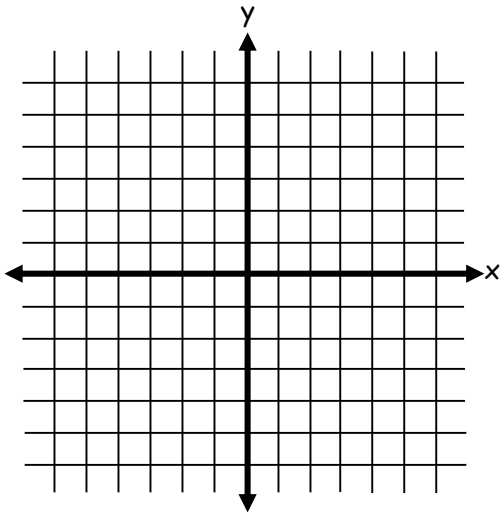
1.6 Piecewise Functions

***Objective*:**

- Graph piecewise functions
- Write the equation of a piecewise defined graph.

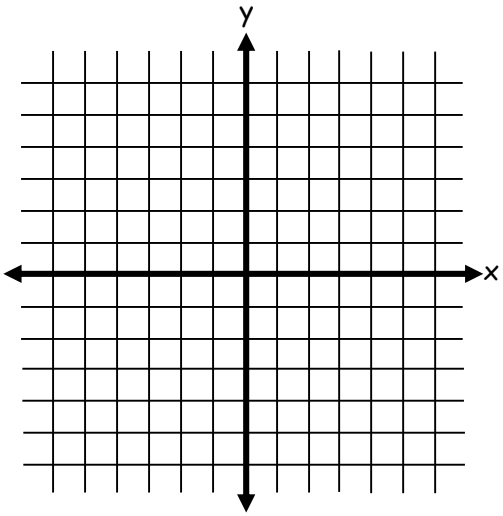
Ex 1: Graph.

$$f(x)=\begin{cases}|x-2| & -4\le x<-1\\ x+1 & -1\le x<3\\ -4 & x>3\end{cases}$$



Ex 2: Graph.

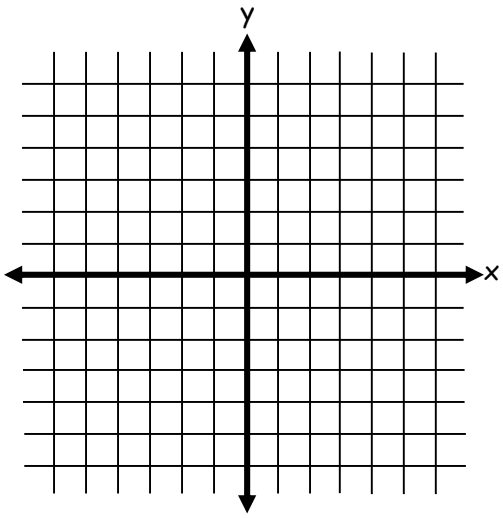
$$f(x)=\begin{cases}2x-3 & x<0\\ 3 & x=0\\ 5 & x>0\end{cases}$$



Key Points:

Ex 3: Graph.

$$f(x)=\begin{cases}-x^2 & x<0\\ \sqrt{x} & 0\le x<4\\ x-4 & x>4\end{cases}$$

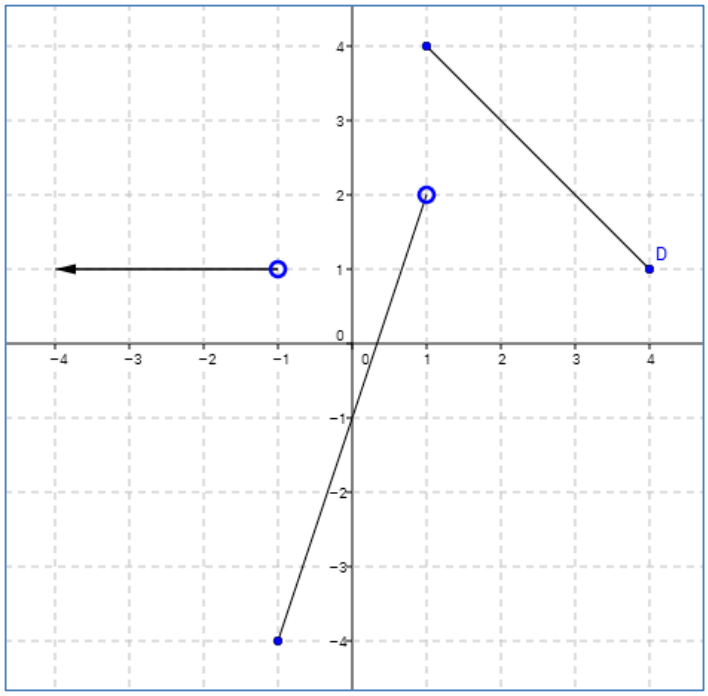


Key Points:

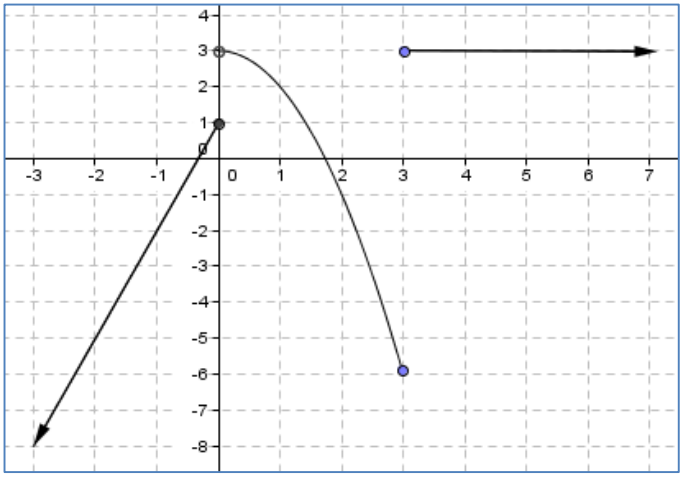
Can you go backwards?

Write the equation for the piecewise defined functions shown below.

$$f(x)=\begin{cases}\_\_\_\_\_ & \_\_\_\_\_\\ \_\_\_\_\_ & \_\_\_\_\_\\ \_\_\_\_\_ & \_\_\_\_\_\end{cases}$$



$$f(x)=\begin{cases}\_\_\_\_\_ & \_\_\_\_\_\\ \_\_\_\_\_ & \_\_\_\_\_\\ \_\_\_\_\_ & \_\_\_\_\_\end{cases}$$



Evaluating an Input

$$h(x)=\begin{cases}x^2-15 & -7<x\le 0\\ |x+4| & 0<x<6\\ 3x & 6\le x<8\\ \dfrac{x}{3x+1} & x>8\end{cases}$$

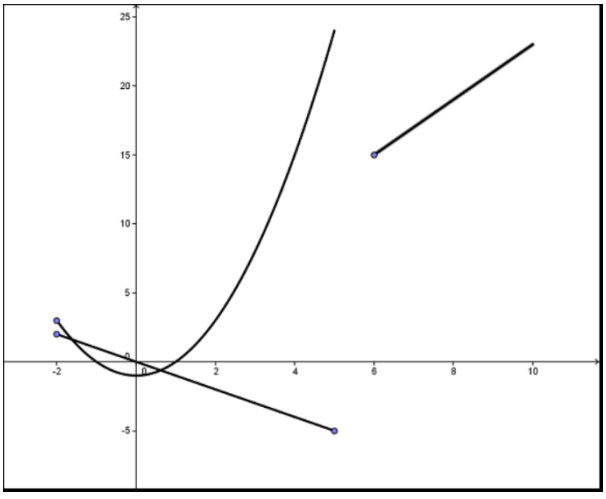
Find the following:

$h(-5)$ $h(6)$ $h(2)$ $h(123)$

Error Analysis

A function and graph are shown below. Can you identify ALL the errors?

$$f(x)=\begin{cases}2x+3 & x>5\\ -1 & -2\le x\le 5\\ x^2-1 & x<-2\end{cases}$$



1.4 Building Functions from Functions

***Objective*:**

- Combine functions through various operations.
- Explore the domain of functions that are a result of these operations
- Evaluate the values of functions using graphs

How much do you already know?

(1) Given $f(x) = x^2 - 2$ and $g(x) = 7 - x^3$, find

a. $(f+g)(x)$

b. $(f-g)(x)$

c. $(fg)(x)$

d. $\left(\frac{f}{g}\right)(x)$

e. $(f+g)(-2)$

f. $(f-g)(-2)$

g. $(fg)(-2)$

h. $\left(\frac{f}{g}\right)(-2)$

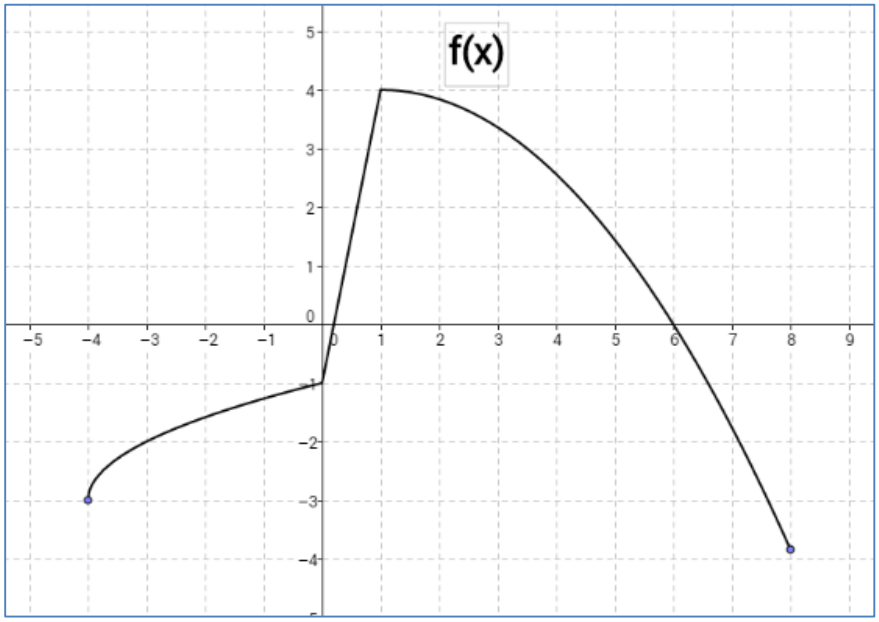
(2) What is the domain of $(f+g)(x)$?

(3) What is the domain of $\left(\frac{g}{f}\right)(x)$?

(4) If $f(x) = \sqrt{3x-1}$ and $g(x) = \frac{1}{3}x^2$, what is the domain of $f(g(x))$?

(5) A taste of Calculus: If $f(x) = 2x^2 + 1$, can you find $\frac{f(x+h) - f(x)}{h}$

Evaluate the expressions using the graphs below.



$f(0) - 6g(4) =$ _____

$\frac{g(-1)}{f(-3)} =$ _____

$(-f(1)g(3))^{1/2} =$ _____