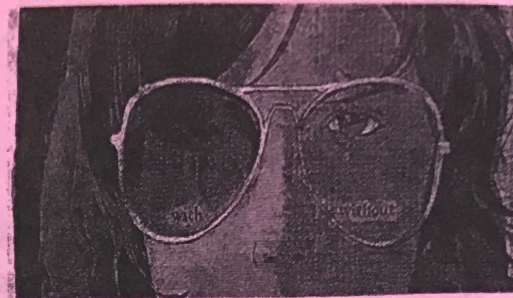
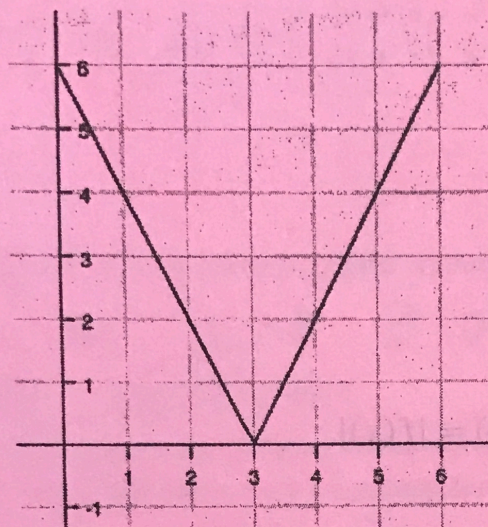


4.3 More Functions, with Features

A Solidify Understanding Task



Michelle likes riding her bike to and from her favorite lake on Wednesdays. She created the following graph to represent the distance she is away from the lake while biking.



1. Interpret the graph by writing three observations about Michelle's bike ride.

Use the story context to make three observations

2. Write a piece-wise function for this situation, with each linear function being in point-slope form using the point (3,0). What do you notice?

$$f(x) = \begin{cases} -2(x-3) & 0 < x \leq 3 \\ 2(x-3) & 3 < x \leq 6 \end{cases}$$

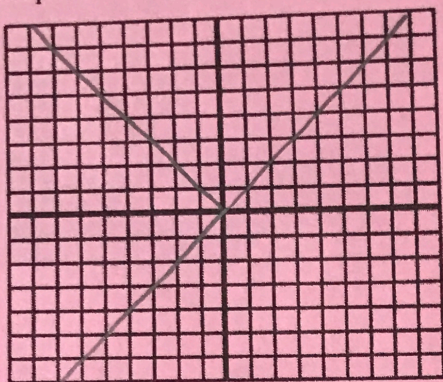
3. This particular piece-wise function is called a linear absolute value function. What are the traits you are noticing about linear absolute value functions?

List at least 3 traits from the function above.

Part II

In this part of the task, you will solidify your understanding of piece-wise and use your knowledge of transformations to make sense of absolute value functions. Follow the directions and answer the questions below.

1. Graph the linear function $f(x) = x$



2. On the same set of axes, graph $g(x) = |f(x)|$.

3. Explain what happens graphically from $f(x)$ to $g(x)$.

Explain your own observations. Notice that all negative y-values become positive, positive values stay the same.

4. Write the piece-wise function for $g(x)$. Explain your process for creating this piece-wise function and how it connects to your answer in question 3.

$$g(x) = \begin{cases} -x & -\infty < x \leq 0 \\ x & 0 < x < \infty \end{cases} \quad \text{Explain}$$

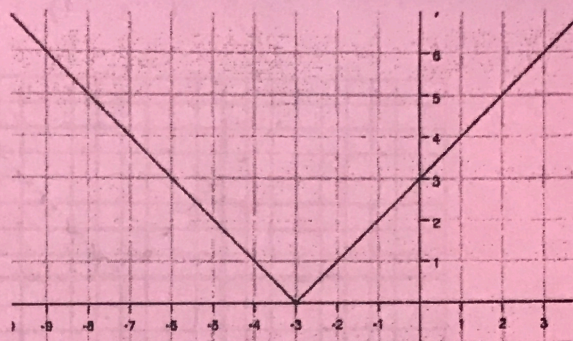
5. Create a table of values from $[-4, 4]$ for $f(x)$ and $g(x)$. Explain how this connects to your answer in questions 3 and 4.

x	$f(x)$	$g(x)$
-4	-4	4
-3	-3	3
-2	-2	2
-1	-1	1
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4

6. The graph below is another example of an absolute value function. The equation of this function can be written two ways:

as an absolute value function: $f(x) = |x + 3|$

or as a piece-wise: $f(x) = \begin{cases} -(x + 3), & x < -3 \\ (x + 3), & x \geq -3 \end{cases}$

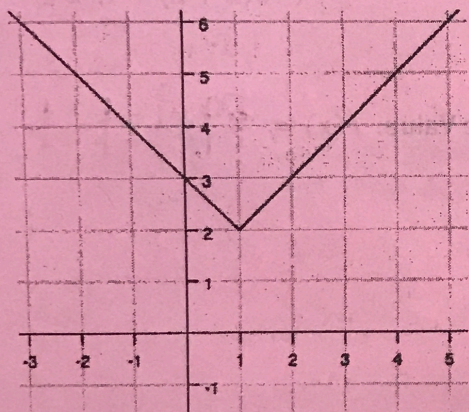


How do these two equations relate to each other?

Give at least 3 observations comparing the two equations

Below are graphs and equations of more linear absolute value functions. Write the piece-wise function for each. See if you can create a strategy for writing these equations.

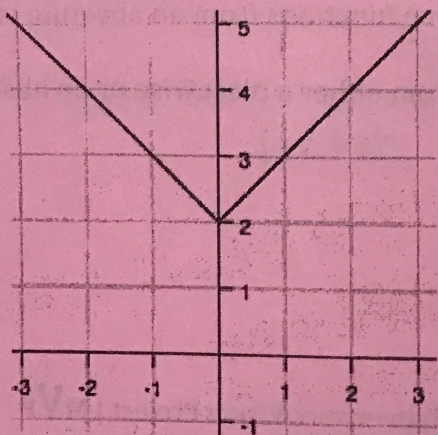
7.



Absolute value: $f(x) = |x - 1| + 2$

Piece-wise: $f(x) = \begin{cases} -(x-1)+2 & -\infty < x \leq 1 \\ 1(x-1)+2 & 1 < x < \infty \end{cases}$

8.

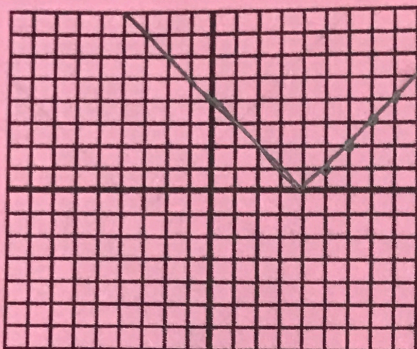


Absolute value: $f(x) = |x| + 2$

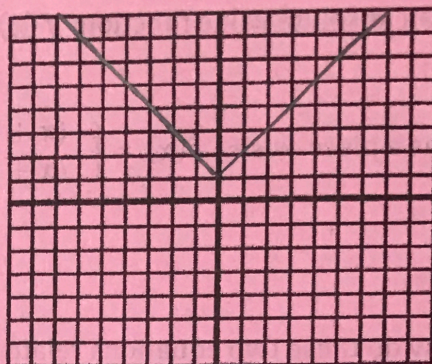
Piece-wise: $f(x) = \begin{cases} -x+2 & -\infty < x \leq 0 \\ x+2 & 0 < x < \infty \end{cases}$

Graph the following linear absolute value piece-wise functions.

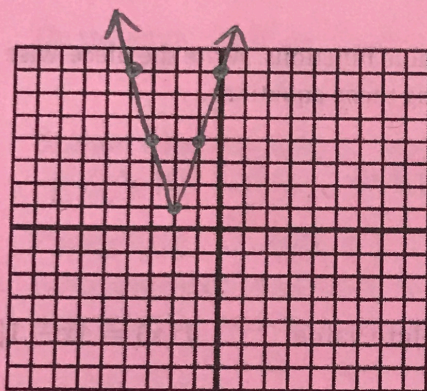
$$9. f(x) = |x - 4| = \begin{cases} -(x - 4), & x < 4 \\ (x - 4), & x \geq 4 \end{cases}$$



$$10. f(x) = |x| + 1 = \begin{cases} -(x) + 1, & x < 0 \\ (x) + 1, & x \geq 0 \end{cases}$$



11.



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

$$\text{Absolute Value: } f(x) = 3|x + 2| + 1$$

12. Explain your method for doing the following:

- Writing piecewise linear absolute value functions from a graph. *Explain in detail*
- Writing piecewise linear absolute value functions from an absolute value function. *Explain in detail*
- Graphing absolute value functions (from either a piecewise or an absolute value equation). *Explain in detail*