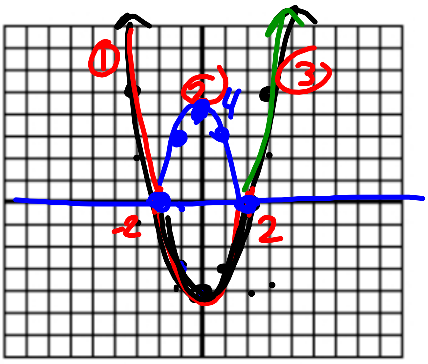
4.4 Reflections of a Bike Lover

A Practice Understanding Task

1. Graph the function $f(x) = x^2 - 4$

   down

2. Graph $g(x) = |f(x)|$ on the same set of axes as *f(x)*.

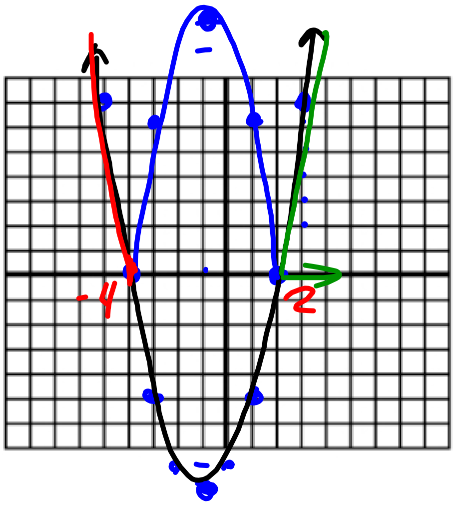


3. Explain what happens graphically.

   the negative section is flipped over and made positive

4. Write the piecewise function for $g(x)$.

$$g(x)=\begin{cases} x^2-4, & x < -2 \\ -[x^2-4] \Rightarrow -x^2+4, & -2 \le x \le 2 \\ x^2-4, & x > 2 \end{cases}$$



left down

5. Graph the function $f(x) = (x+1)^2 - 9$

6. Graph $g(x) = |f(x)|$.

7. Explain what happens graphically.
negative section is made positive

8. Write the piecewise function for $g(x)$.

$$\begin{cases} (x+1)^2-9, & x<-4 \\ -[(x+1)^2-9] \to -(x+1)^2+9, & -4 \le x \le 2 \\ (x+1)^2-9, & x>2 \end{cases}$$

9. What do you have to think about when writing any absolute value piecewise function?
① graph vertex, and parabola
② take absolute value of graph (neg → pos)
③ write equations for each piece.
* the flipped section's equation is negative.

Graph the following absolute value functions and write the corresponding piecewise functions for each.

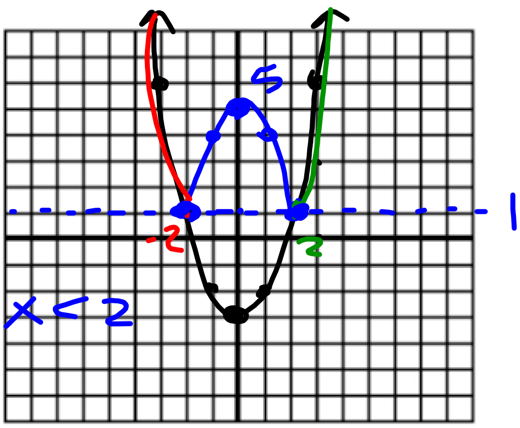
down 3

10. $g(x) = |x^2 - 4| + 1$

$x^2 - 3$

Piecewise:

$$\begin{cases} x^2 - 3, & x < -2 \\ -\boxed{x^2 - 4} + 1 \rightarrow -x^2 + 4 + 1 \\ -x^2 + 5, & -2 < x < 2 \\ x^2 - 3, & x > 2 \end{cases}$$



down 1

left down 4, up 3

11. $g(x) = |(x+2)^2 - 4| + 3$

$(x+2)^2 - 1$

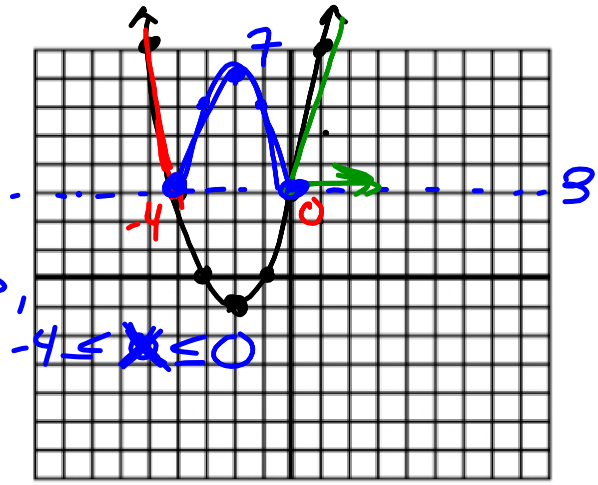
Piecewise:

$(x+2)^2 - 1, \quad x < -4$

$-[(x+2)^2 - 4] + 3 \rightarrow -(x+2)^2 + 4 + 3, \quad -4 \le x \le 0$

$-(x+2)^2 + 7$

$(x+2)^2 - 1, \quad x > 0$



exponential, doubling

down 4

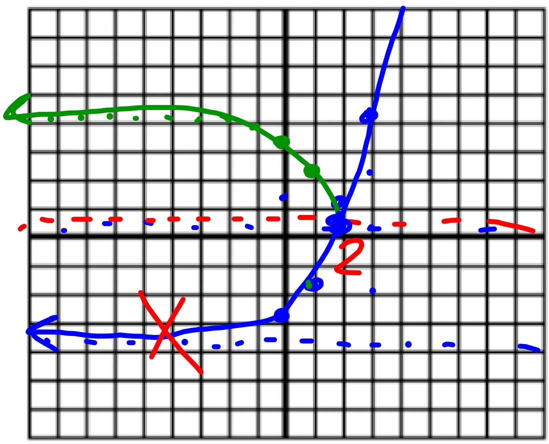
12. $g(x) = |2^x - 4|$

0	$2^0 \rightarrow 1$
1	$2^1 \rightarrow 2$
2	$2^2 \rightarrow 4$
3	$2^3 \rightarrow 8$

Piecewise:

$-[2^x - 4] \rightarrow -2^x + 4, \quad x < 2$

$2^x - 4, \quad x \ge 2$



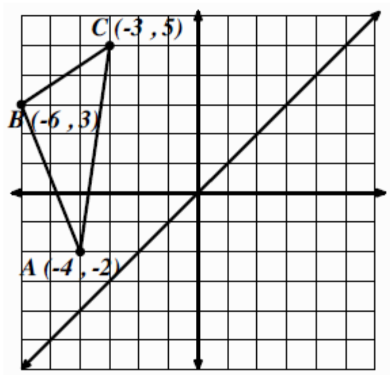
4.4

READY, SET, GO! Name Period Date

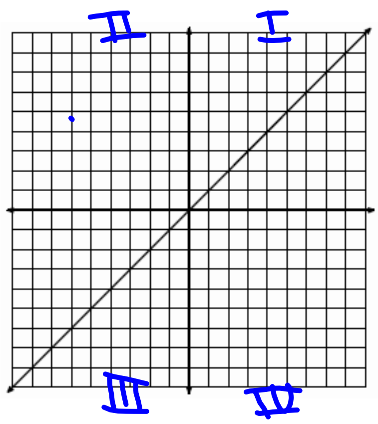
READY

Topic: Reflecting Images

1. Reflect ΔABC across the line y = x. Label the new image as $\Delta A'B'C'$. Label the coordinates of *points* $A'B'C'$. Connect segments *AA'*, *BB'*, and *CC'*. Describe how these segments are related to each other and to the line y = x .



2. On the graph provided to the right, draw a 5-sided figure in the 4th quadrant. Label the vertices of the pre-image. Include the coordinates of the vertices. Reflect the pre-image across the line y = x. Label the image, including the coordinates of the vertices.



3. A table of values for a four-sided figure is given in the first two columns. Reflect the image across the line y = x, and write the coordinates of the reflected image in the space provided.

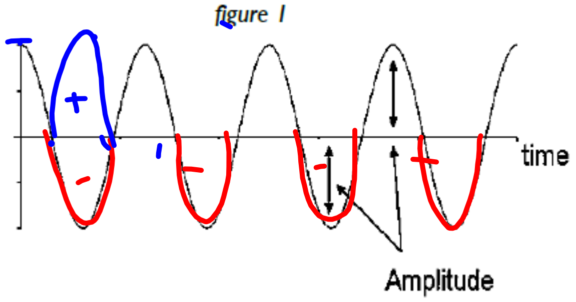
A	$(-6,2)$	A'	
B	$(-4,5)$	B'	
C	$(-2,3)$	C'	
D	$(-3,-1)$	D'	

SET

Topic: Absolute value and non-linear functions

4. *Figure 1* is the graph of a sound wave. The height (or depth) of the graph indicates the magnitude and direction *f(x)* reaches from the norm or the undisturbed value. In this case that would be the x-axis. When we are only concerned with the distance from the x-axis, we refer to this distance as the **amplitude.** Since distance alone is always positive, **amplitude** can be described as the absolute value of *f(x).* Use the graph of a sound wave to sketch a graph of the absolute value of the amplitude or $y = |f(x)|$.

figure 1



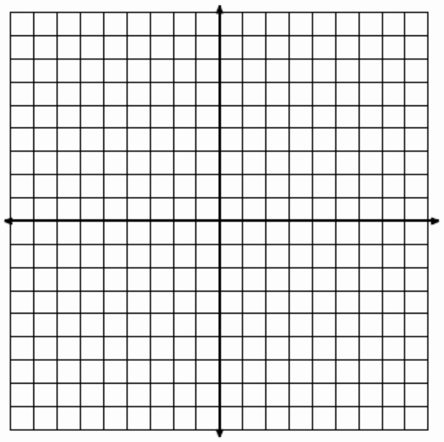
5. *Figure 2* is a table of values for $g(x) = (x+3)^2 - 9$
What values in the table would need to change if the function were redefined as $h(x) = |g(x)|$?

figure 2

x	$g(x)$
-8	16
-7	7
-6	0
-5	-5
-4	-8
-3	-9
-2	-8
0	0
1	7
2	16

-1; 5

6. Graph $h(x) = |g(x)|$.



7. Write the piece-wise equation for $h(x) = |g(x)|$, as defined in question 6. Let the domain be all real numbers in the interval [-8, 2].

GO

Topic: Simplifying Radical Expressions

Simplify. Write the answers in simplest radical form. Some answers may consist of numbers with no radical sign.

8. $(-7 - 2\sqrt{5}) + (6 + 8\sqrt{5})$

$\boxed{-1 + 6\sqrt{5}}$

9. $(-10 - \sqrt{13}) - (-11 + 5\sqrt{13})$

10. $(4 - \sqrt{50}) + (7 + 3\sqrt{18}) - (12 + 2\sqrt{72})$

5 10 5 2 3 6 3 2 2 36 4 9 2 2 3 3

$4 - 5\sqrt{2} + 7 + 9\sqrt{2} - 12 + 12\sqrt{2}$

$\boxed{-1 + 16\sqrt{2}}$

11. $\sqrt{98} + \sqrt{8}$

12. $(-2 - 7\sqrt{5}) + (2\sqrt{125}) - 3\sqrt{625}$

13. $(3r^2 - 8\sqrt{3b^2}) - (2r^2 - 3\sqrt{27b^2})$

14.
Write an equivalent form using exponents: $\sqrt{x} + \sqrt{x^3} + \sqrt{x^5} + \sqrt{x^7} + \sqrt{x^9} + \sqrt{x^{11}} + \sqrt{x^{13}} + \sqrt{x^{15}}$.
Assume that $x \geq 0$.

$$\sqrt{x + x^3 + x^5 + x^7 + x^9 + x^{11} + x^{13} + x^{15}}$$

$$= (x + x^3 + x^5 + x^9 + x^{11} + x^{13} + x^{15})^{\frac{1}{2}}$$