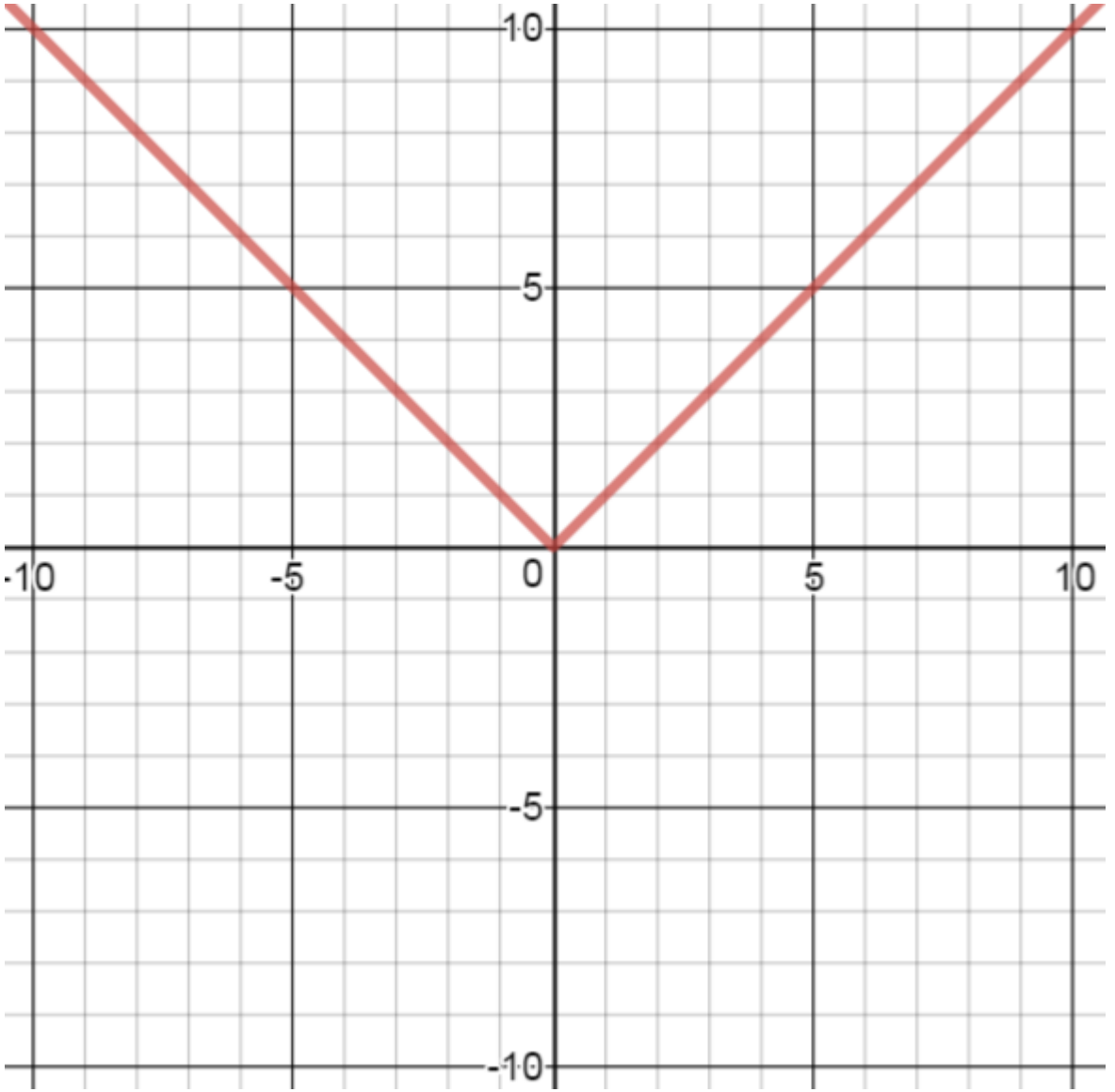
Warm-up:
Graph the function shown and reflect it over the *x*-axis



Recall that a function $t(x)$ of the form $t(x) = f(x) + D$ is a vertical translation of the function $f(x)$. The value $|D|$ describes how many units up or down the graph of the original function is translated.

4. Describe each graph in relation to the basic function $g(x) = |x|$. Then use coordinate notation to represent the vertical translation.

a. $f(x) = g(x) + D$ when $D > 0$

b. $f(x) = g(x) + D$ when $D < 0$

c. Each point (x, y) on the graph of $g(x)$ becomes the point _____ on $f(x)$.

Consider these absolute value functions.

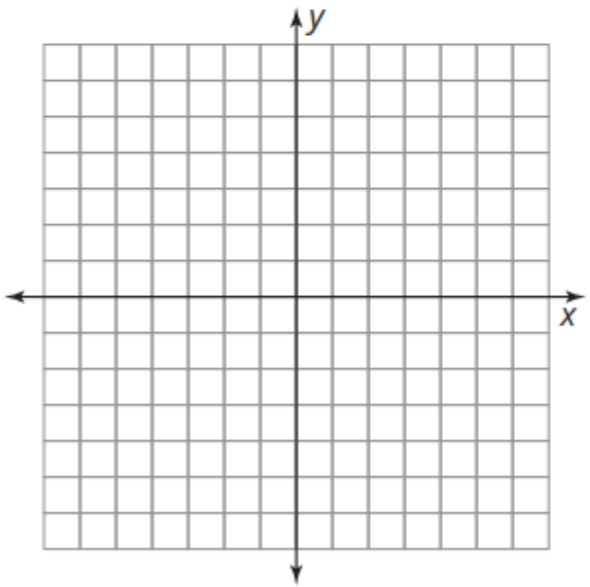
$g(x) = |x|$

$k(x) = \frac{1}{2}|x|$

$j(x) = 2|x|$

$p(x) = -|x|$

5. Use technology to graph each function. Then, sketch and label the graph of each function.



6. Write the functions $j(x)$, $k(x)$, and $p(x)$ in terms of the basic function $g(x)$. Then describe the transformations of each function.

Recall that a function $t(x)$ of the form $t(x) = A \cdot f(x)$ is a vertical dilation of the function $f(x)$. The A-value describes the vertical dilation of the graph of the original function.

7. Describe each graph in relation to the basic function $g(x) = |x|$. Then use coordinate notation to represent the vertical translation.

a. $f(x) = A \cdot g(x)$ when $A > 1$

b. $f(x) = A \cdot g(x)$ when $A < 0$

c. $f(x) = A \cdot g(x)$ when $0 < A < 1$

d. Each point (x, y) on the graph of $g(x)$ becomes the point _____ on $f(x)$.

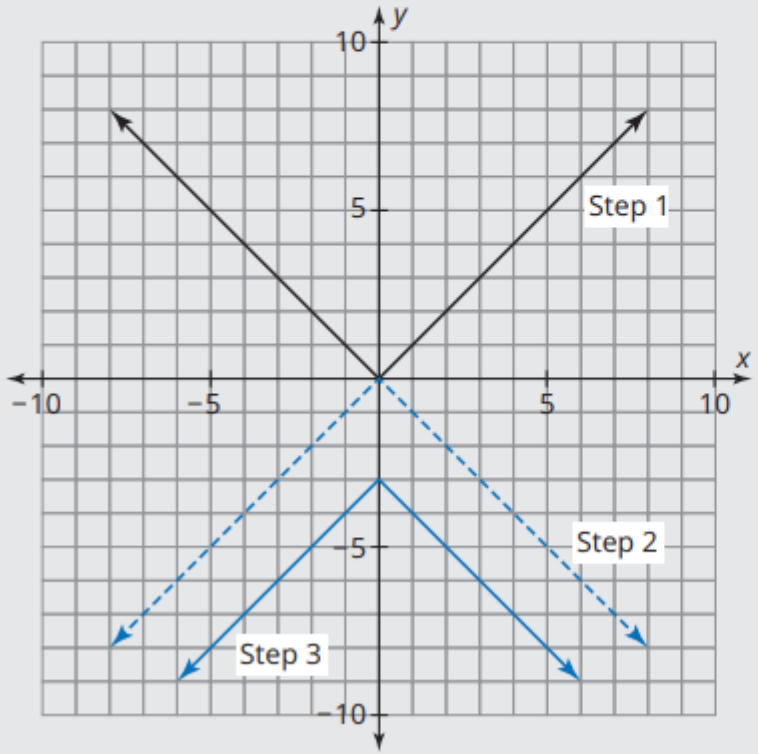
You know that changing the *A*-value of a function to its opposite reflects the function across a horizontal line. But the *line of reflection* for the function might be different depending on how you write the transformation and the order the transformations are applied.

A **reflection** of a graph is the mirror image of the graph about a line of reflection.

A **line of reflection** is the line that the graph is reflected across. A horizontal line of reflection affects the *y*-coordinates.

8. Josh and Vicki each sketched a graph of the function $b(x) = -|x| - 3$ using different strategies. Write the step-by-step reasoning used by each student.

Josh

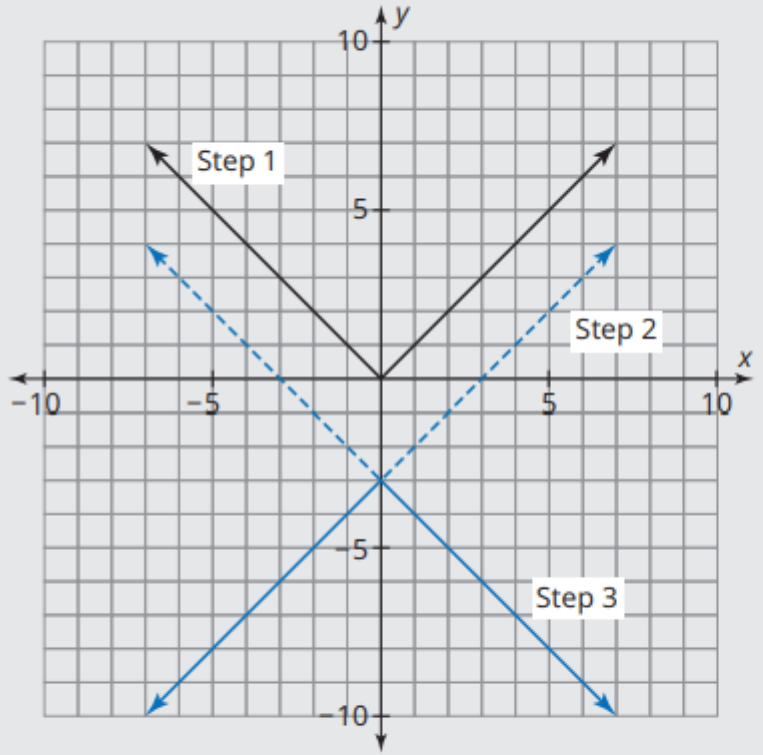


Step 1:

Step 2:

Step 3:

Vicki



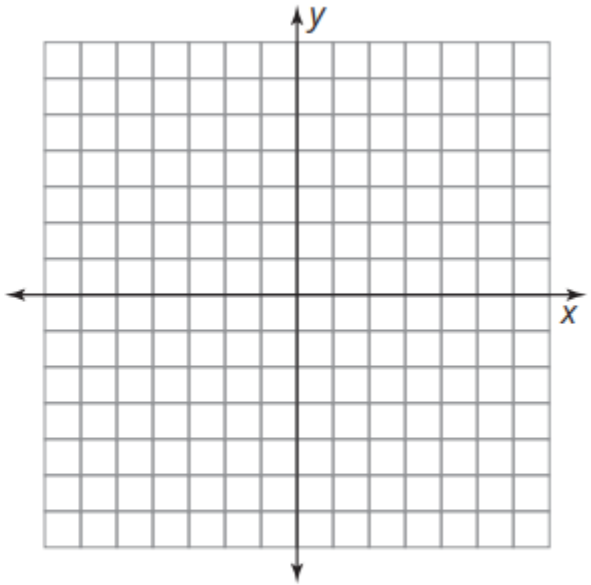
Step 1:

Step 2:

Step 3:

9. Explain how changing the order of the transformations affects the line of reflection.

Given the function $f(x) = |x|$. Use the coordinate plane shown to answer Questions 10 through 14.



10. Consider the function $a(x) = 2f(x) + 1$.

a. Use coordinate notation to describe how each point (x, y) on the graph of $f(x)$ becomes a point on the graph of $a(x)$.

b. Graph and label $a(x)$ on the coordinate plane shown.

11. Consider the function $b(x) = -2f(x) + 1$.

a. Use coordinate notation to describe how each point (x, y) on the graph of $f(x)$ becomes a point on the graph of $b(x)$.

b. Graph and label $b(x)$ on the same coordinate plane shown.

13. Consider the function $-a(x)$.

a. Use coordinate notation to describe how each point (x, y) on the graph of $a(x)$ becomes a point on the graph of $-a(x)$.

b. Graph and label $-a(x)$ on the coordinate plane shown.

14. Describe the graph of $-a(x)$ in terms of $a(x)$.