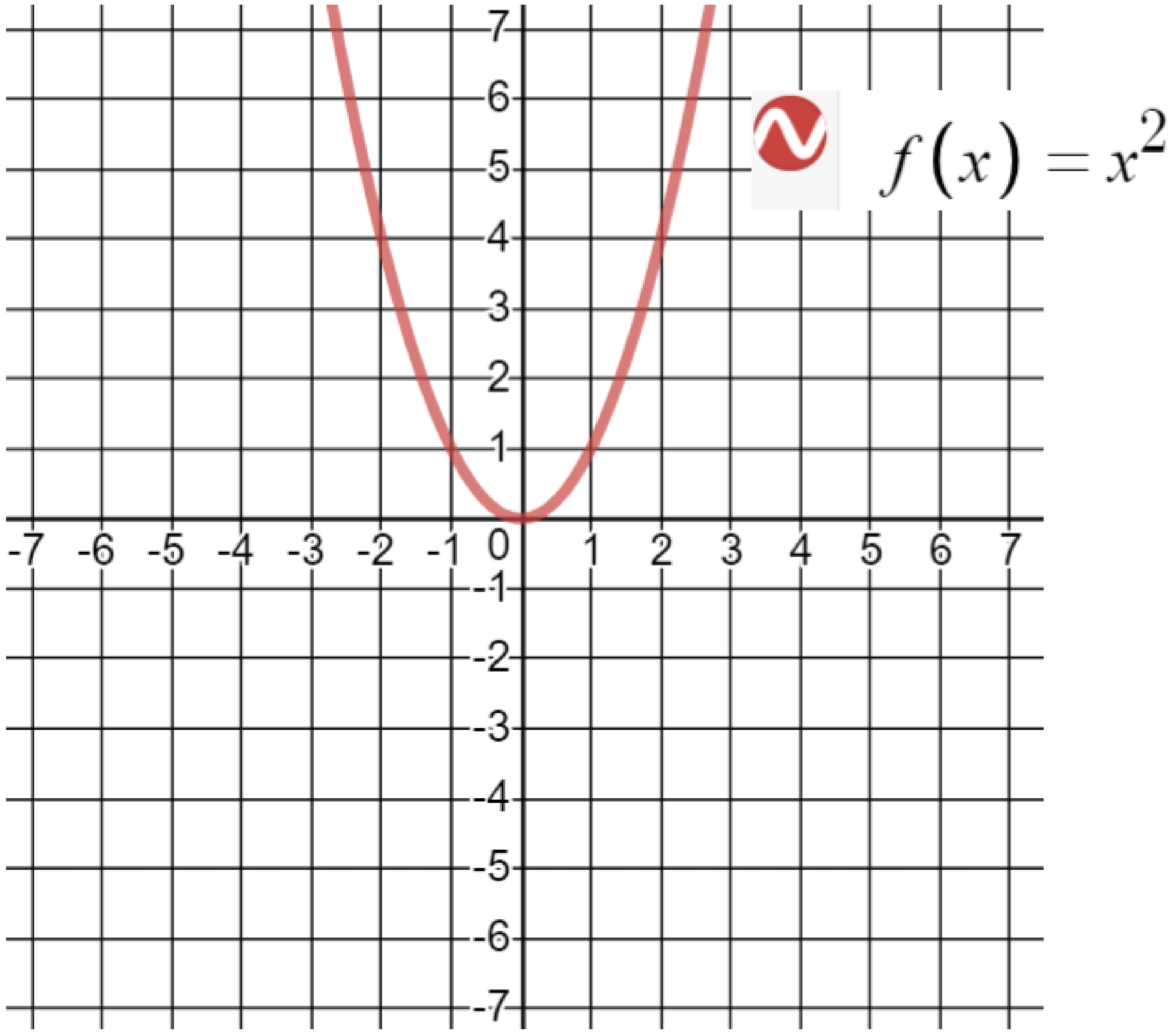
Warm-up:

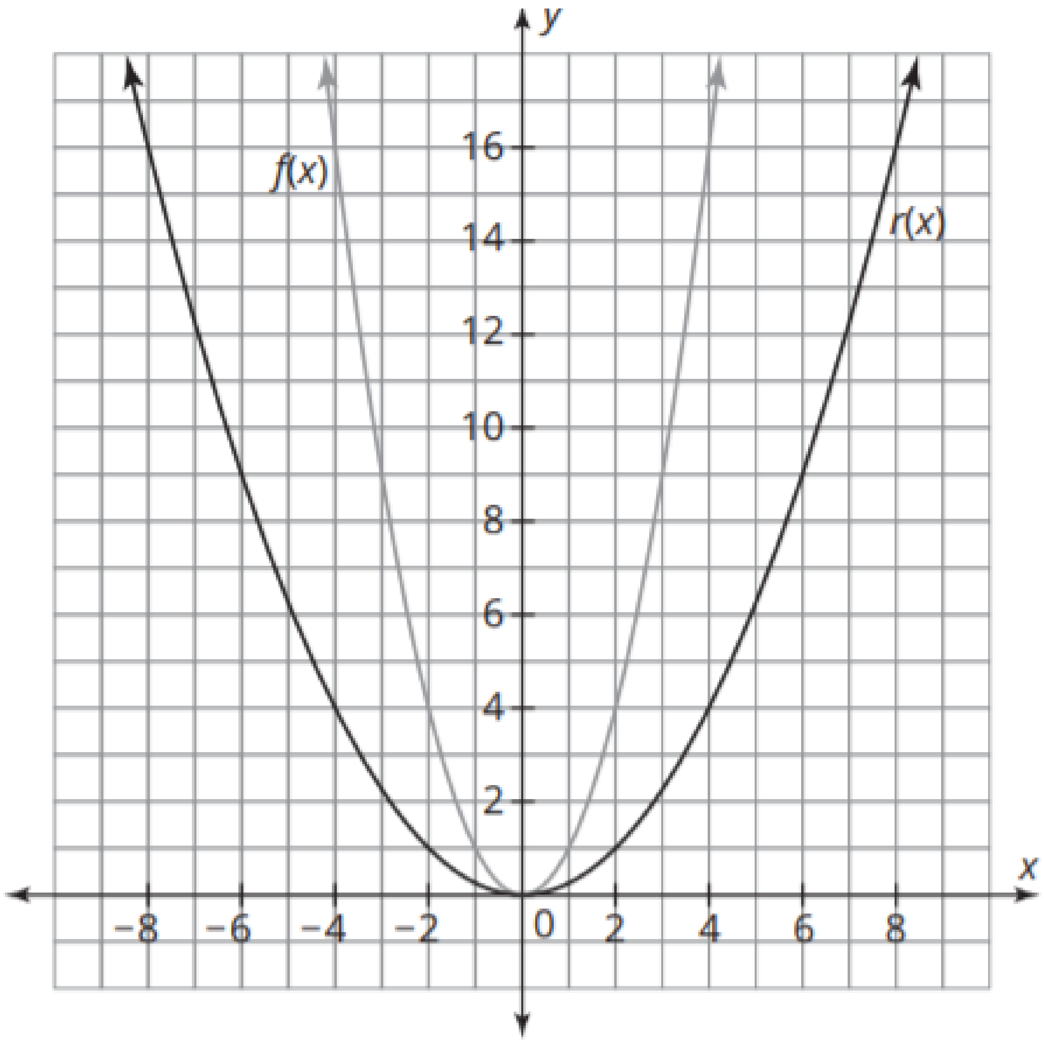
Use transformations to graph each

$$g(x) = x^2 + 2$$

$$g(x) = x^2 - 3$$



3. Now, let's compare the graph of $f(x) = x^2$ with $r(x) = f\left(\frac{1}{2}x\right)$.



x	$f(x) = x^2$	$r(x) = p(\frac{1}{2}x)$
0	0	0
1	1	0.25
2	4	1
3	9	2.25
4	16	4
5	25	6.25
6	36	9

a. Analyze the table of values that correspond to the graph.

Circle instances where the *y*-values for each function are the same. Then, list all the points where $f(x)$ and $r(x)$ have the same *y*-value. The first instance has been circled for you.

b. How do the *x*-values compare when the *y*-values are the same?

c. Complete the statement.

The function $r(x)$ is a ____________ of $f(x)$ by a factor of ____________.

d. How does the factor of stretching or compression compare to the B-value in $r(x)$?

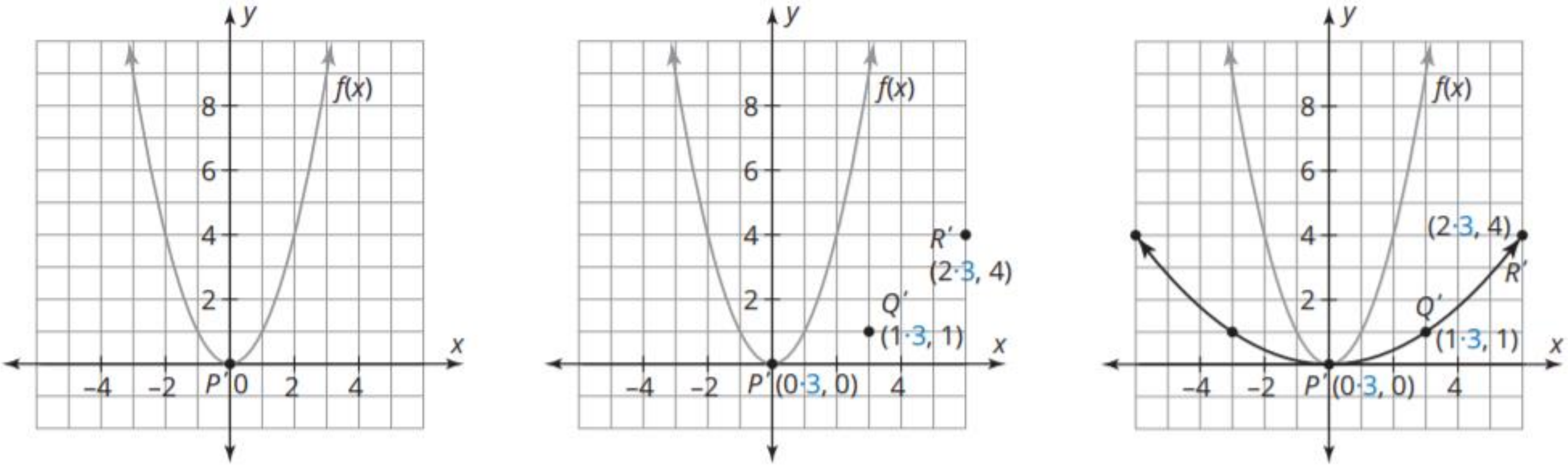
Compared with the graph of $f(x)$, the graph of $f(Bx)$ is:

- horizontally compressed by a factor of $\frac{1}{|B|}$ if $|B| > 1$.
- horizontally stretched by a factor of $\frac{1}{|B|}$ if $0 < |B| < 1$.

You can use reference points to graph the function $q(x) = f(\frac{1}{3}x)$ when $f(x) = x^2$. M3-199

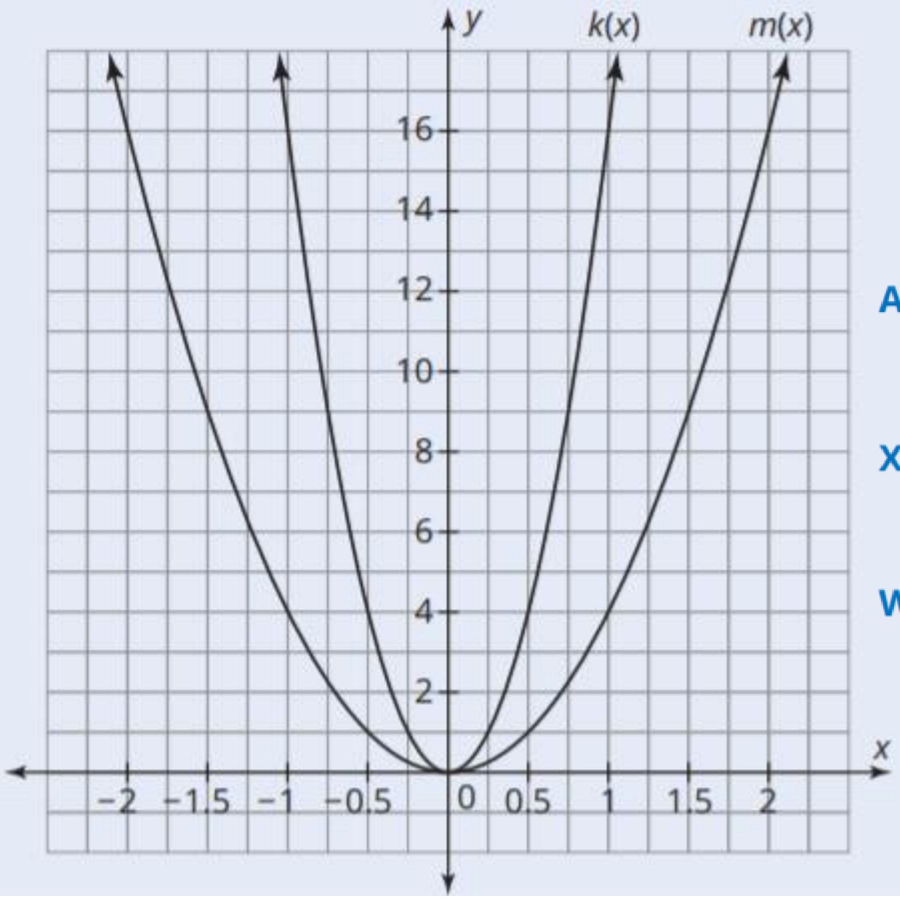
From $q(x)$ you know that $C = 0$, $D = 0$, and $B = \frac{1}{3}$. The vertex for $q(x)$ is $(0, 0)$.

Notice $0 < |B| < 1$, so the graph will horizontally stretch by a factor of $\frac{1}{\frac{1}{3}}$ or 3.



4. If you were asked to graph $p(x) = f(3x)$, describe how the graph would change. If (x, y) is any point on $f(x)$, describe any point on $p(x)$.

5. **Consider the graph showing the quadratic functions $k(x)$ and $m(x)$. Antoine and Xi Ling are writing the function $m(x)$ in terms of $k(x)$.**



Antoine says that $m(x)$ is a transformation of the A-value.

$$m(x) = \frac{1}{4}k(x)$$

Xi Ling says that $m(x)$ is a transformation of the B-value.

$$m(x) = k\left(\frac{1}{2}x\right)$$

Who's correct? Justify your reasoning.

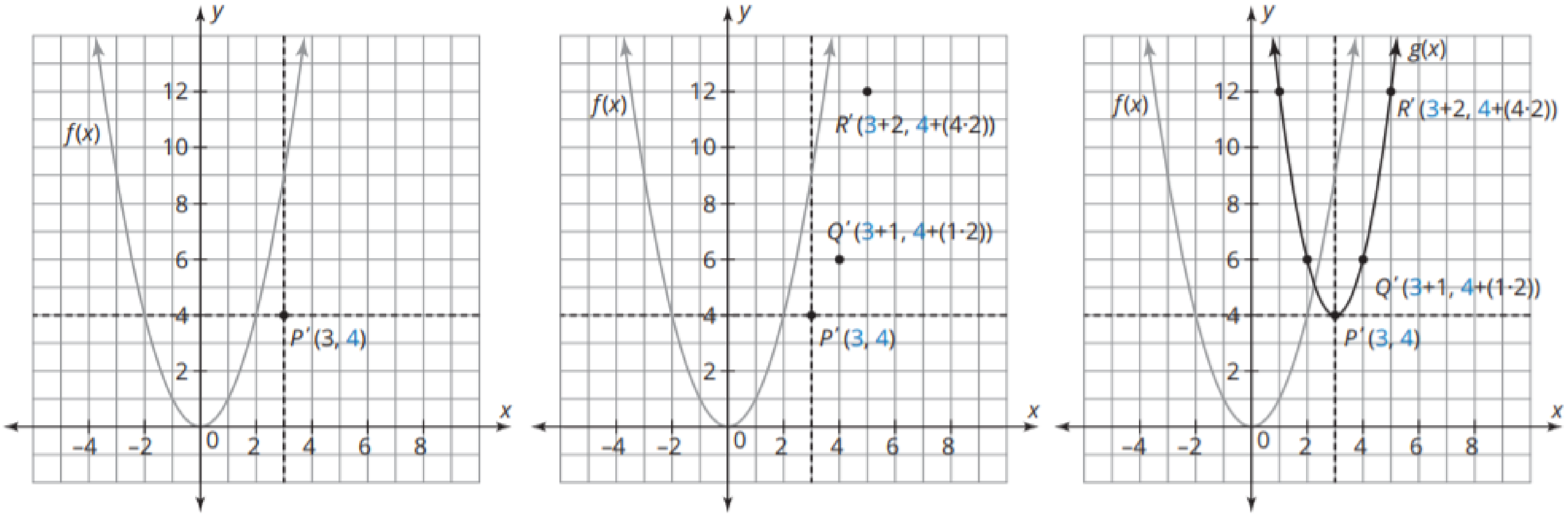
Given $y = f(x)$ is the basic quadratic function, you can use reference points to graph $y = Af(B(x - C)) + D$. Any point (x, y) on $f(x)$ maps to the point $(\frac{1}{B}x + C, Ay + D)$.

Given $f(x) = x^2$, graph the function $g(x) = 2f(x - 3) + 4$.

You can use reference points for $f(x)$ and your knowledge about transformations to graph the function $g(x)$.

From $g(x)$, you know that $A = 2$, $C = 3$, and $D = 4$.

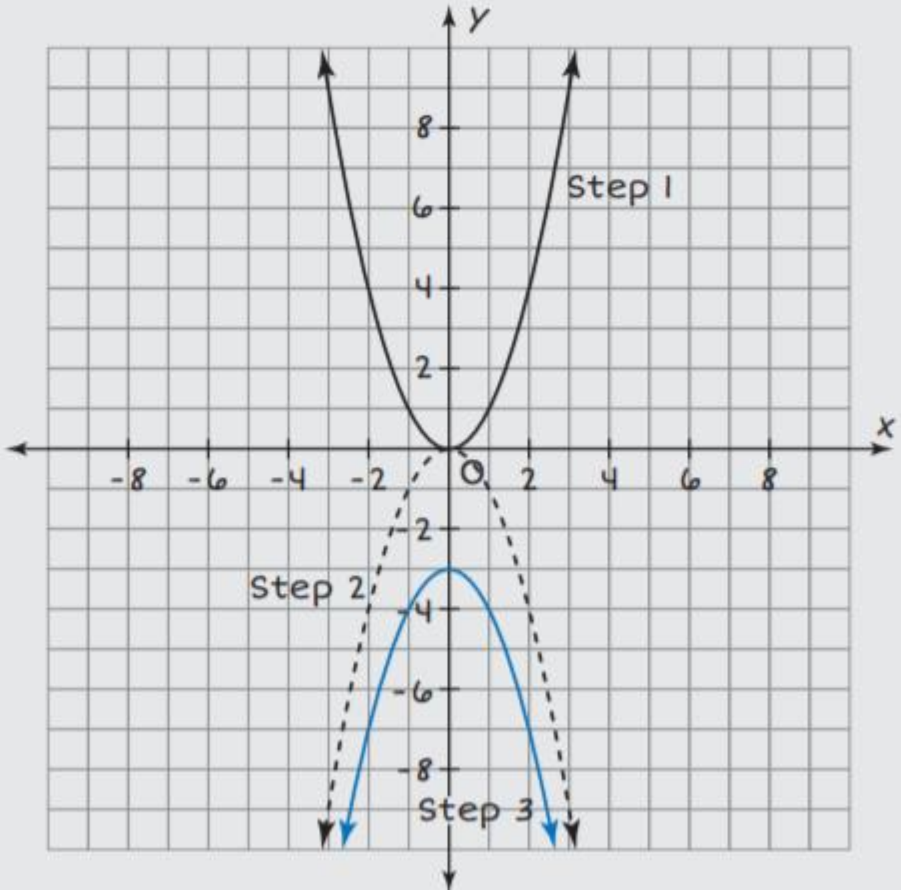
The vertex for $g(x)$ will be at (3, 4). Notice $A > 0$, so the graph of the function will vertically stretch by a factor of 2.



1. Christian, Julia, and Emily each sketched a graph of the equation $y = -x^2 - 3$ using different strategies. Provide the step-by-step reasoning used by each student.

Christian

A = −1 and D = −3



Step 1:

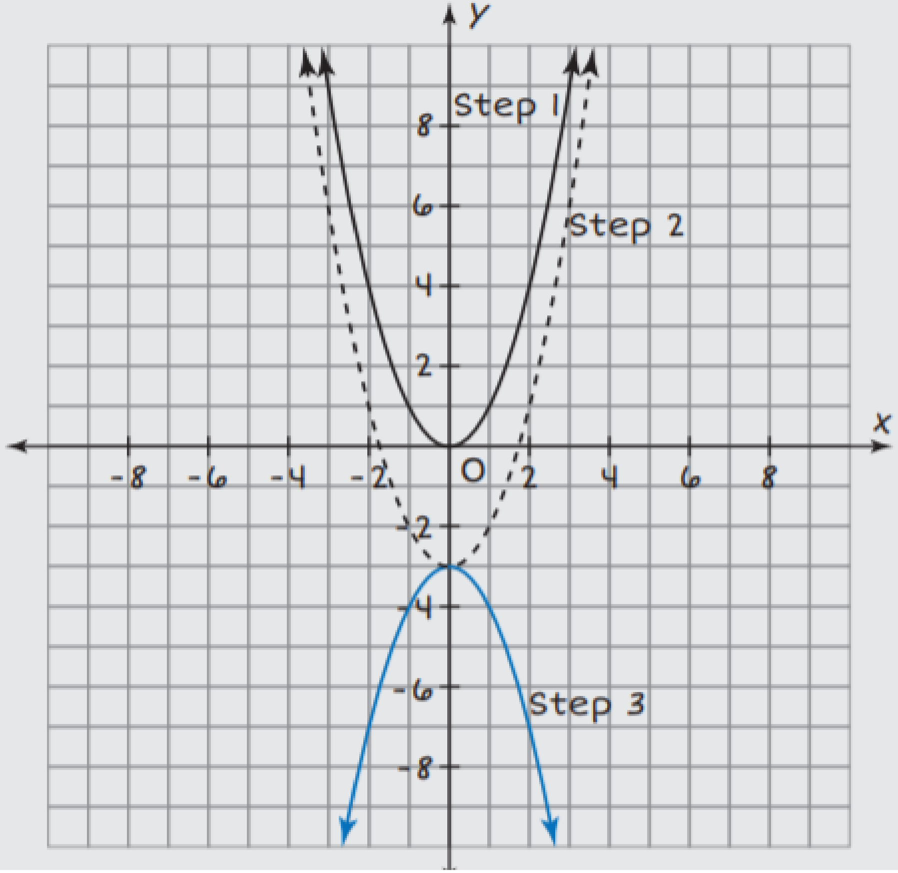
Step 2:

Step 3:

1. **Christian, Julia, and Emily each sketched a graph of the equation $y = -x^2 - 3$ using different strategies. Provide the step-by-step reasoning used by each student.**

Julia

$D = -3$ and $A = -1$



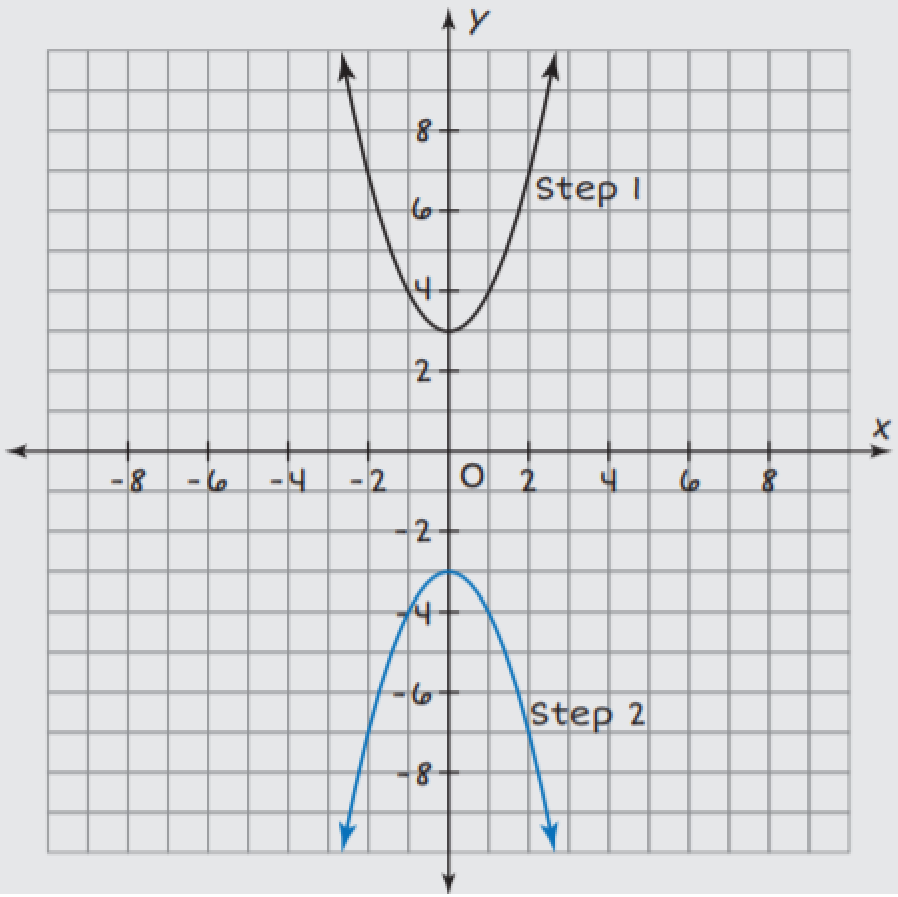
Step 1:

Step 2:

Step 3:

Emily

I rewrote the equation as $y = -(x^2 + 3)$.

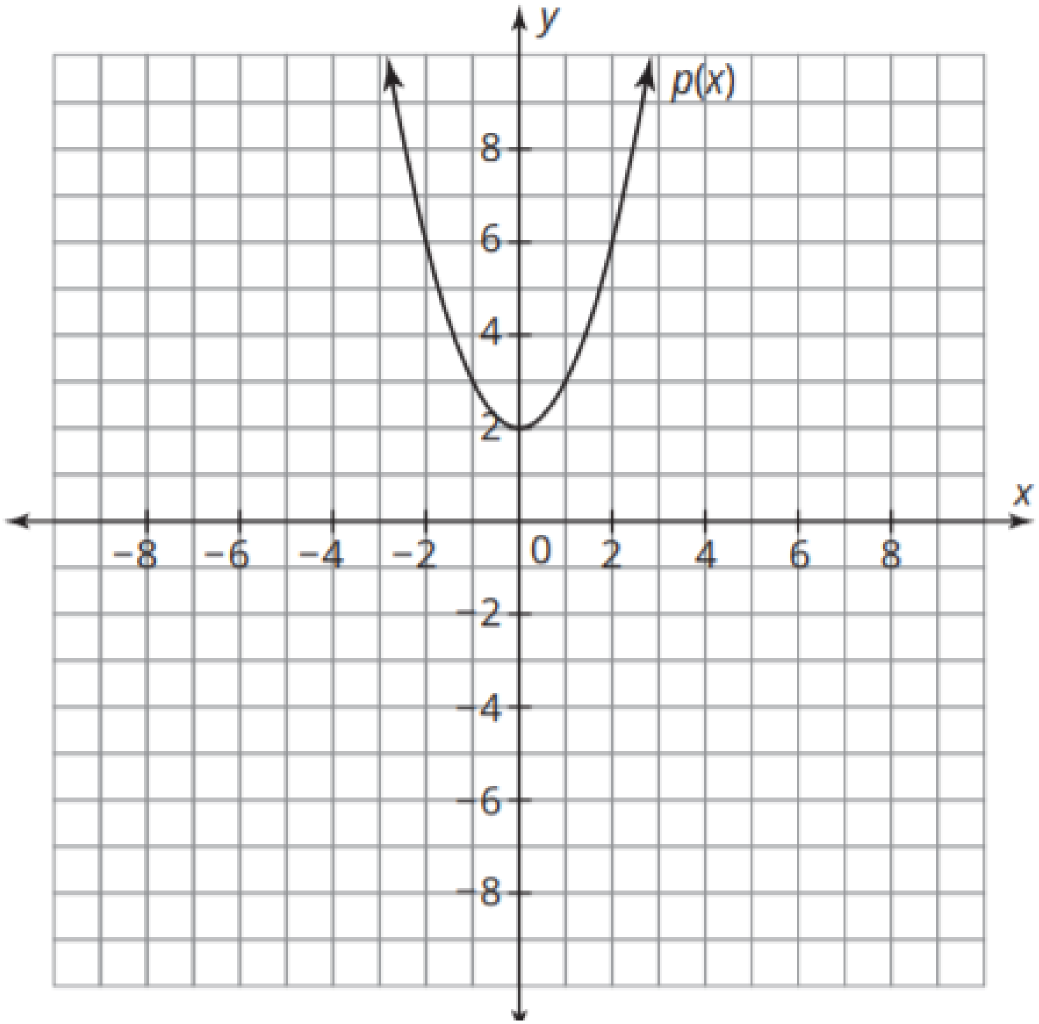


Step 1:

Step 2:

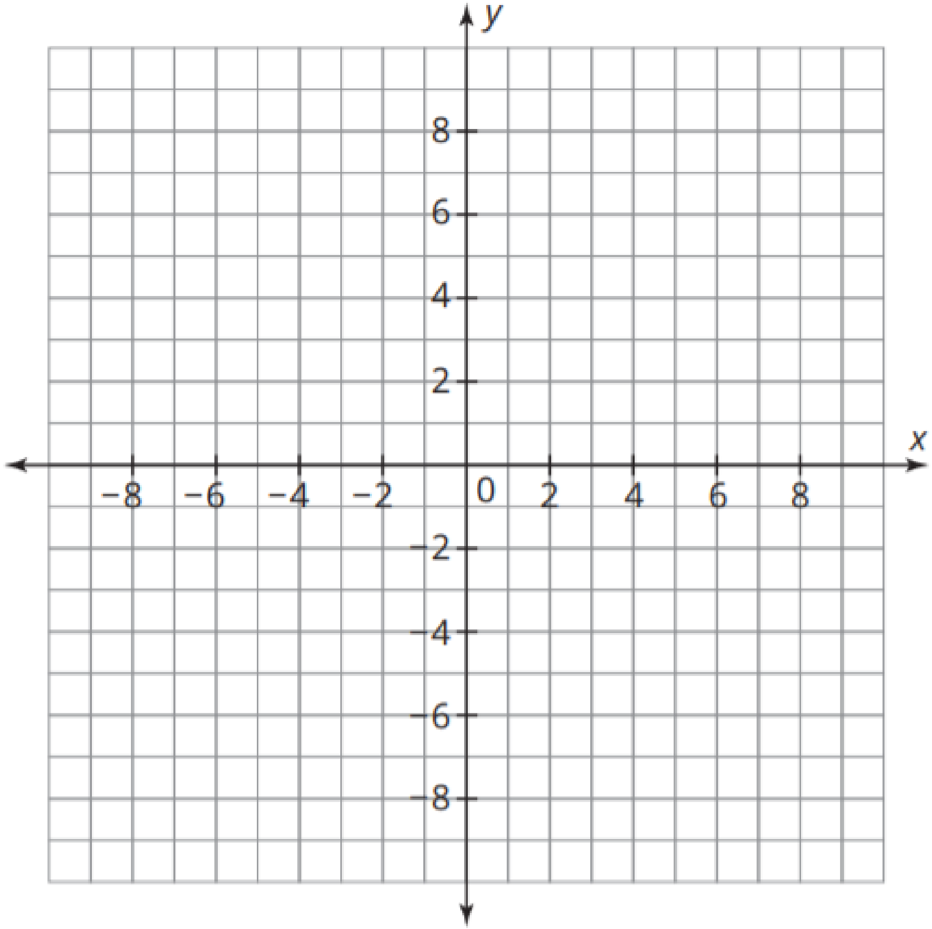
2. Given $y = p(x)$, sketch $m(x) = -p(x + 3)$. Describe the transformations you performed.

M3-204

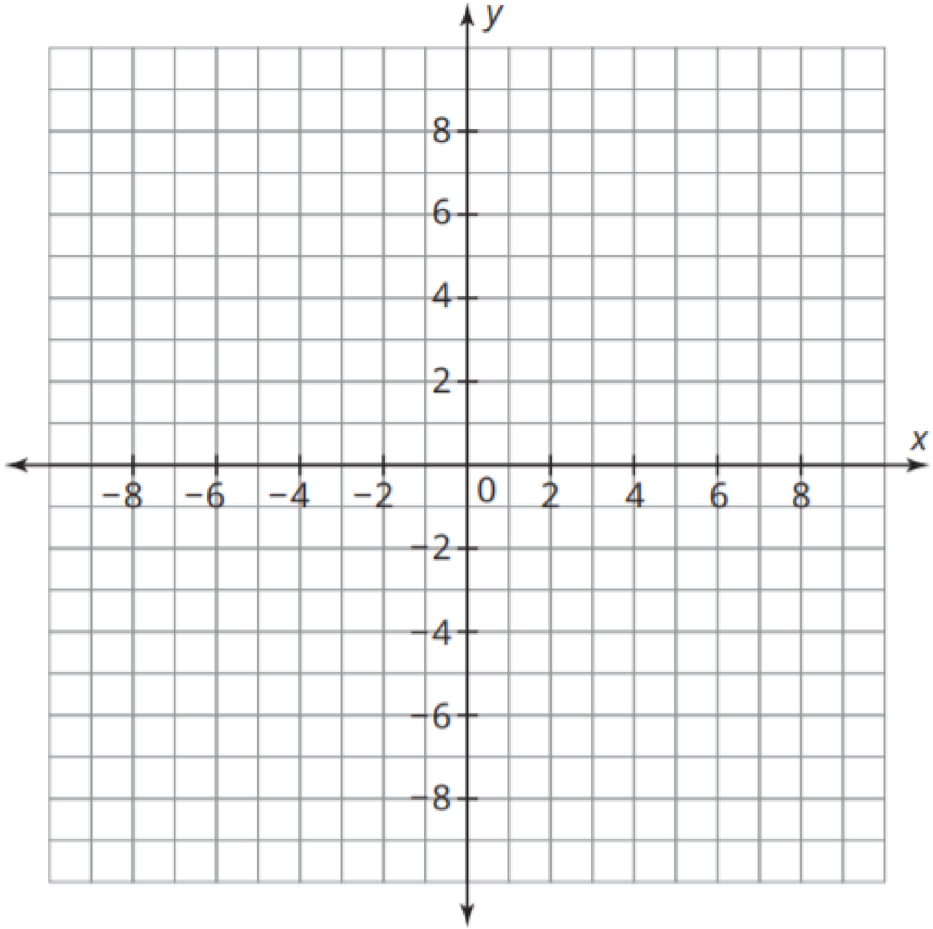


3. **Given $f(x) = x^2$, graph each function. Then write each corresponding quadratic equation.**

a. $f'(x) = \frac{1}{2}f(x - 2) + 3$



b. $f'(x) = -3f(x + 1) + 1$



4. Write $n(x)$ in terms of $d(x)$. Then write the quadratic equation for $n(x)$.