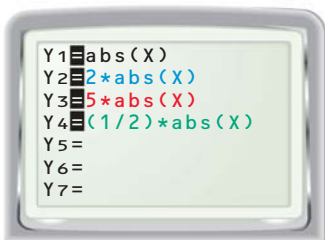**EXAMPLE 3** Graph $y = a|x|$ where a is a positive number
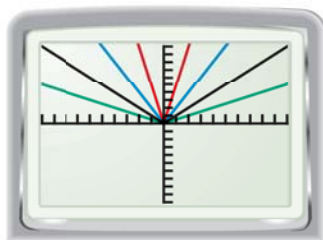
Graph and describe the family of absolute value functions of the form $y = a|x|$ where $a > 0$.

STEP 1 *Vary the value of a*
Enter $y = |x|$, $y = 2|x|$, $y = 5|x|$, and $y = \frac{1}{2}|x|$.

STEP 2 *Display graphs*
Graph the equations in the standard viewing window by pressing **ZOOM** **6** .

STEP 3 *Compare graphs*
Describe how the family of graphs of $y = a|x|$ where $a > 0$ is related to the graph of $y = |x|$.

```
Y1=abs(X)
Y2=2*abs(X)
Y3=5*abs(X)
Y4=(1/2)*abs(X)
Y5=
Y6=
Y7=
```


As with $y = |x|$, the graph of $y = a|x|$ ($a > 0$) has its lowest point at the origin. If $a > 1$, the graph is narrower than that of $y = |x|$. If $0 < a < 1$, the graph is wider than that of $y = |x|$.

PRACTICE

1. Graph and describe the family of absolute value functions of the form $y = a|x|$ where $a < 0$. Follow these steps:

   STEP 1 Enter $y = |x|$, $y = -|x|$, $y = -3|x|$, and $y = -\frac{1}{2}|x|$.

   STEP 2 Graph the equations in the standard viewing window by pressing **ZOOM** **6** .

   STEP 3 Describe how the family of graphs of $y = a|x|$ where $a < 0$ is related to the graph of $y = |x|$.

Describe **how the graph of the given equation is related to the graph of $y = |x|$. Then graph the given equation along with $y = |x|$ to confirm your answer.**

2. $y = |x| + 6$

3. $y = |x| - 4$

4. $y = |x - 3|$

5. $y = |x + 2|$

6. $y = \frac{2}{3}|x|$

7. $y = -6|x|$

8. $y = |x - 1| + 2$

9. $y = 3|x + 2|$

10. $y = -0.5|x + 1| + 7$

DRAW CONCLUSIONS

Answer the following questions about the graph of $y = a|x - h| + k$.

11. How does the value of k affect the graph?

12. How does the value of h affect the graph?

13. How do the sign and absolute value of a affect the graph?

14. What are the coordinates of the lowest or highest point on the graph? How can you tell whether this point is the lowest point or the highest point?