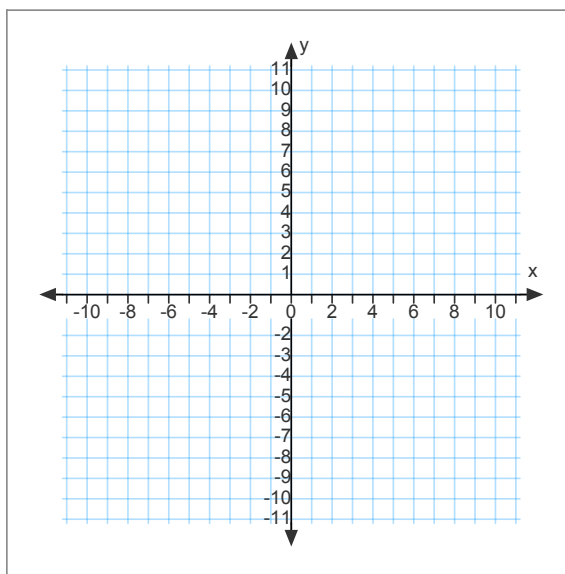


## 7.2 Absolute Value Functions

Compare the graphs of  $y = x$  and  $y = |x|$ .

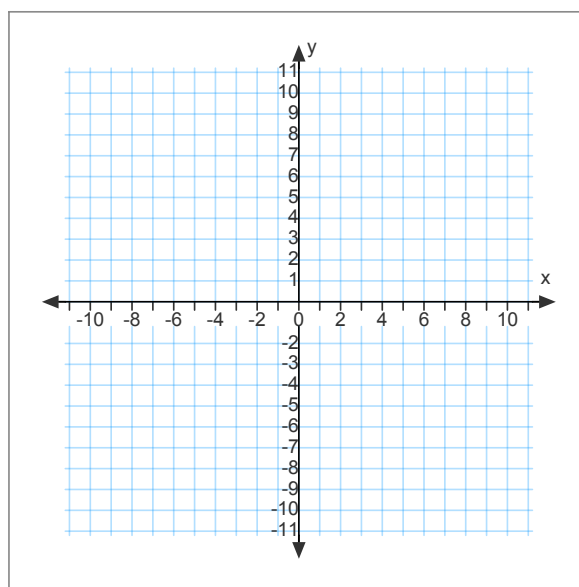
1.  $y = x$

X	Y
-3	-3
-2	-2
-1	-1
0	0
1	1
2	2
3	3



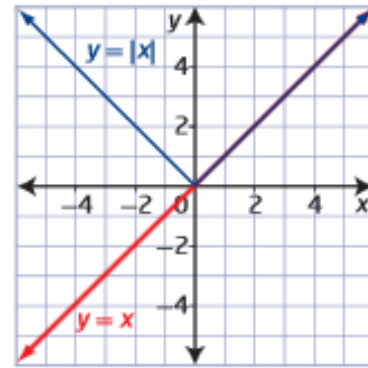
2.  $y = |x|$

X	Y
-3	
-2	
-1	
0	
1	
2	
3	



**NOTES:**

- The vertex  $(0, 0)$  divides the graph  $y = |x|$  into two distinct pieces.
- Therefore, we can write this absolute function as a **piecewise function**:
  
- **Invariant point** - a point that remains unchanged when a transformation is applied to it.



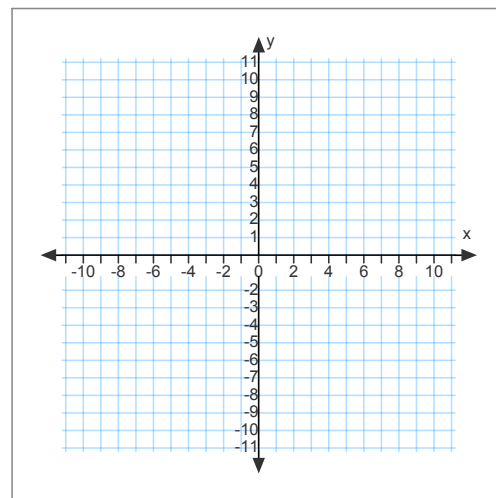
**Example 1**

**Graph an Absolute Value Function of the Form  $y = |ax + b|$**

Consider the absolute value function  $y = |2x - 3|$ .

- Determine the y-intercept and the x-intercept.
- Sketch the graph.
- State the domain and range.
- Express as a piecewise function.

Use Method 2 in the text.

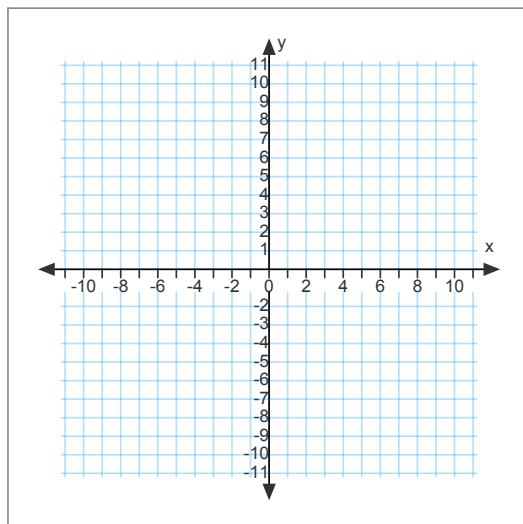


Turn over

### Example 1: Your Turn

Consider the absolute value function  $y = |3x + 1|$ .

- Determine the y-intercept and the x-intercept.
- Sketch the graph.
- State the domain and range.
- Express as a piecewise function.



Turn over

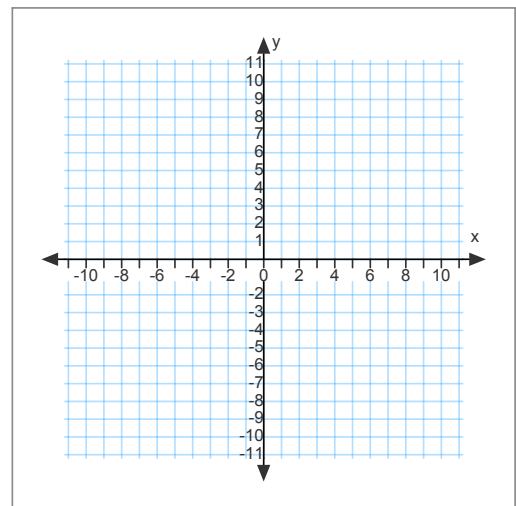
## Example 2

**Graph an Absolute Value Function of the Form  $f(x) = |ax^2 + bx + c|$** Consider the absolute value function  $f(x) = |-x^2 + 2x + 8|$ .

- Determine the y-intercept and the x-intercepts.
- Sketch the graph.
- State the domain and range.
- Express as a piecewise function.

To sketch the graph, remember  

$$x = -\frac{b}{2a}$$
to determine the vertex

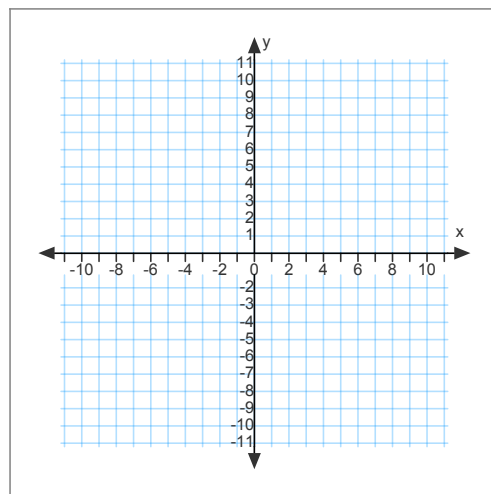


Turn Over

## Example 2: Your Turn

Consider the absolute value function  $f(x) = |x^2 - x - 2|$ .

- Determine the y-intercept and the x-intercepts.
- Sketch the graph.
- State the domain and range.
- Express as a piecewise function.

**NOTES:**

- In general, you can express the absolute value function  $y = |f(x)|$  as the piecewise function:

$$y = \begin{cases} f(x), & \text{if } f(x) \geq 0 \\ -f(x), & \text{if } f(x) < 0 \end{cases}$$

- The domain of an absolute value function  $y = |f(x)|$  is the same as the domain of the function  $y = f(x)$
- The range of an absolute value function  $y = |f(x)|$  depends on the range of the function  $y = f(x)$ . For the absolute value of a linear or quadratic function, the range will generally, but not always, be  $\{y \mid y \geq 0, y \in \mathcal{R}\}$  (when the graph crosses the x-axis)

Key Ideas p. 375

Assign p. 375, #2, 4, 5ab, 6ace, 7bc, 8ace, 9ac, 10ac, 11bd, 22