Problem 7

Draw the graph of the equation $x + |x| = y + |y|$.

Solution

Consider values of x and y within each of the four quadrants to remove the absolute value signs.

Quadrant 1:	$(x \geq 0$	and	$y \geq 0)$	$x + (x) = y + (y)$	$\rightarrow \quad y = x$
Quadrant 2:	$(x \leq 0$	and	$y \geq 0)$	$x + (-x) = y + (y)$	$\rightarrow \quad y = 0$
Quadrant 3:	$(x \leq 0$	and	$y \leq 0)$	$x + (-x) = y + (-y)$	$\rightarrow \quad 0 = 0$
Quadrant 4:	$(x \geq 0$	and	$y \leq 0)$	$x + (x) = y + (-y)$	$\rightarrow \quad x = 0$

Only points along the line $y = x$ satisfy the equation within the first quadrant, only points along the line $y = 0$ satisfy the equation within the second quadrant, all values of x and y satisfy the equation within the third quadrant, and only points along the line $x = 0$ satisfy the equation within the fourth quadrant. The graph below illustrates these results.