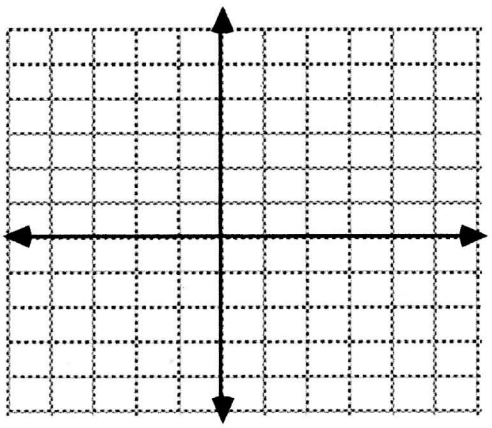
GRAPHING WITH ABSOLUTE VALUE

The ABSOLUTE VALUE FUNCTION is often written as a piecewise defined function using the definition of absolute value:

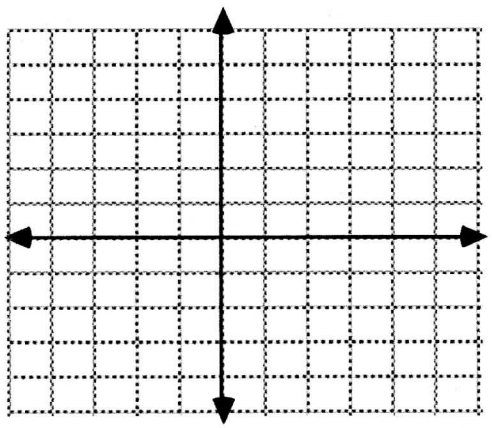
$$|x| = \begin{cases} x \text{ if } x \geq 0 \\ -x \text{ if } x < 0 \end{cases}$$

THINK about this, it is important to know how to apply this definition.

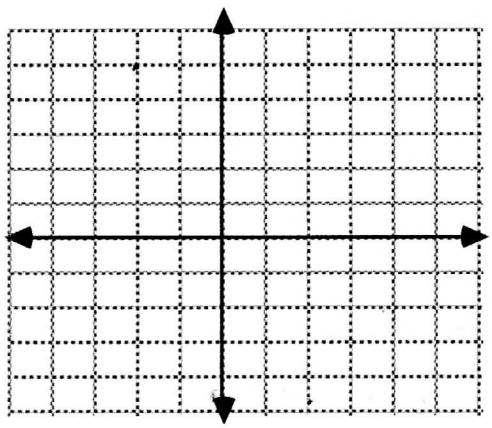
EX. Graph f(x) = $|x|$ by writing it as a piecewise defined function first.



EX. Graph f(x) = $|x|$ - x by using the definition of $|x|$ and writing f(x) as a piecewise defined function first.



You try. Graph f(x) = $\frac{|x|}{x}$



GRAPHING $y = |f(x)|$

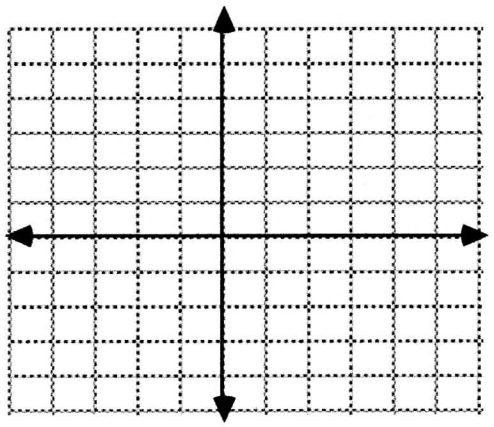
To graph the absolute value of an argument other than just x we can proceed in two different ways.

1) Rewrite the function as a piecewise defined function, *removing the absolute value bars.*
2) Use the graph of f(x).

(1) Removing the absolute value bars. EX: Graph $y = |2x+1|$

Rewriting as a piecewise defined function, $y = |2x+1| = \begin{cases} 2x+1 & \text{if } 2x+1 \geq 0 \\ -(2x+1) & \text{if } 2x+1 < 0 \end{cases}$ which

simplifies to $y = \begin{cases} 2x+1 & \text{if } x \geq -\frac{1}{2} \\ -2x-1 & \text{if } x < -\frac{1}{2} \end{cases}$

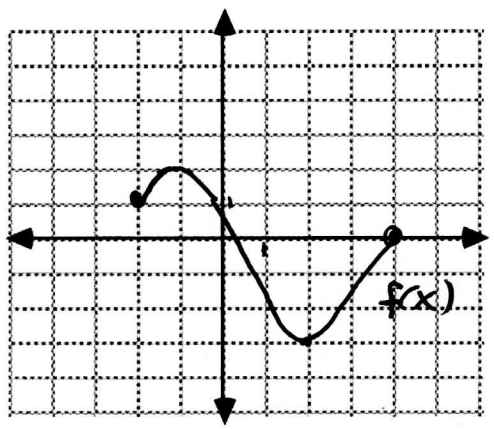


(2) Using the graph of f(x).

If we apply the definition of the absolute value to the expression $|f(x)|$ we get

$$|f(x)| = \begin{cases} f(x) & \text{if } f(x) \geq 0 \quad (\textit{the original function where the graph was above the } x-\textit{axis}) \\ -f((x) & \text{if } f(x) < 0 \quad (\textit{the reflection of the original function where the graph was below the } x-\textit{axis}) \end{cases}$$

EX: Given the graph of y=f(x) below, graph $y = |f(x)|$



Since the outcome of absolute value is always greater than or equal to zero, your final graph should all reside *above or on* the x-axis.