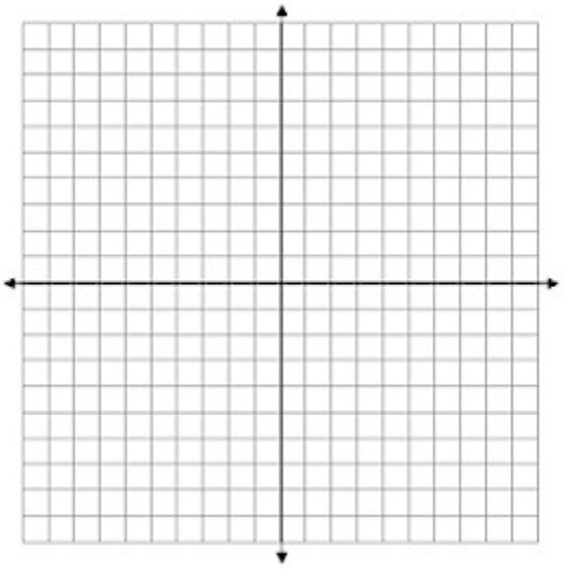
§1.7 Piecewise Functions - Notes and Examples

- For piecewise functions, different equations are used for different intervals of the domain.
- When graphing piecewise functions, the partial graphs over various intervals do not *necessarily* connect. They may or may not touch at their endpoints.

To better understand the relationship between the function pieces and the corresponding domain, draw each piece on the whole axes, and darken the part corresponding to the domain.

Exercise 1

$$f(x)=\begin{cases}1 & \text{if } x\le -2\\ x+2 & \text{if } -2<x\le 3\\ 2x & \text{if } x>3\end{cases}$$

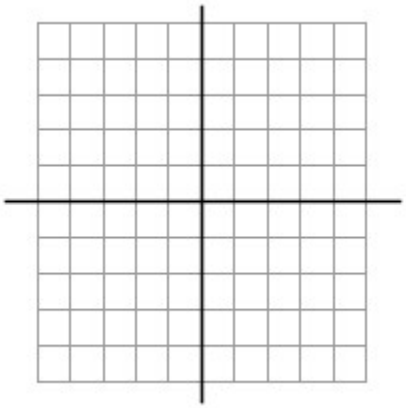


- A <u>step-function</u> is any piecewise function that looks like a set of stairs; there are breaks in the graph, and it cannot be traced without lifting your pencil from the paper.
  - The <u>Greatest-Integer Function</u> is a specific example of a step-function. It is defined to be the greatest integer less than or equal to x. It is denoted by special symbols and notation, as shown below.

    $y=[x]$ *or* $y=\text{int}(x)$
    (MATH » NUM menu on graphing calculators)

  - Examples: $[8.9]$ = _____

    $[-3.9]$ = _____



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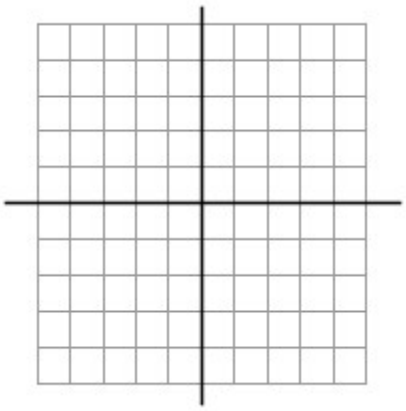
- The Absolute Value Function is a piecewise function that is always connected and in the general shape of a V. Its value is always non-negative—that is, it is positive or zero.

$y = |x|$ or $y = \text{abs}(x)$

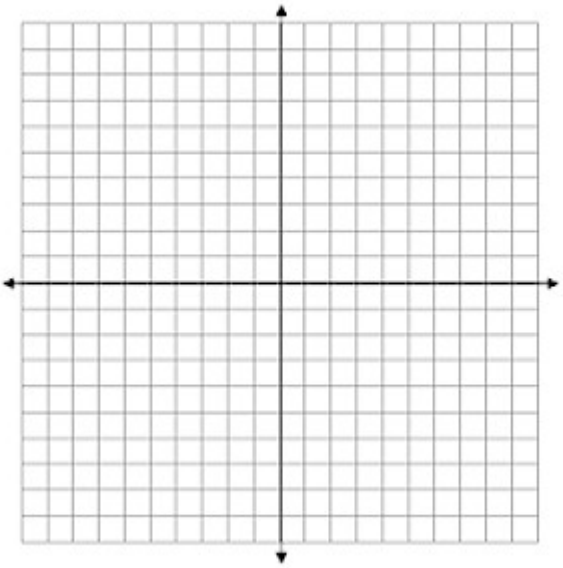
Rewrite the function without using the absolute value sign, as a two-piece function.



Extra Practice Examples

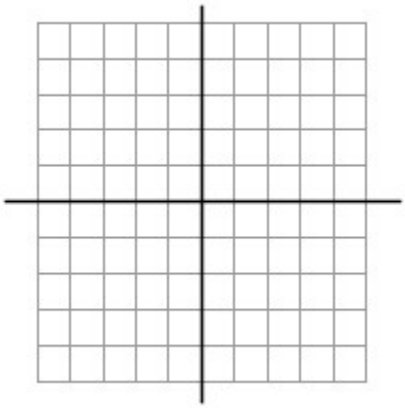
1. Sketch the graph of the function

$$f(x) = \begin{cases} -3x - 9 & \text{if } x \le -4 \\ 3 & \text{if } -4 < x < 1 \\ -x + 4 & \text{if } x \ge 1 \end{cases}$$



2. Sketch the graph of the function

$f(x) = 2[x - 1]$



3. Sketch the graph of the function $f(x) = |2x + 1|$