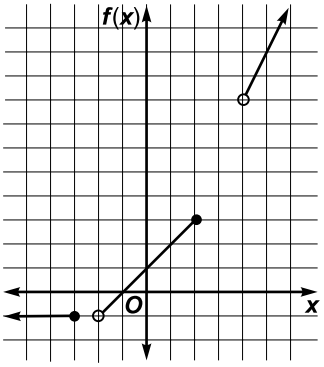
1-7

Study Guide

Piecewise Functions

Piecewise functions use different equations for different intervals of the domain. When graphing piecewise functions, the partial graphs over various intervals do not necessarily connect.

Example 1 **Graph** $f(x) = \begin{cases} -1 & \text{if } x \le -3 \\ 1 + x & \text{if } -2 < x \le 2 \\ 2x & \text{if } x > 4 \end{cases}$



First, graph the constant function $f(x) = -1$ for $x \le -3$. This graph is a horizontal line. Because the point at $(-3, -1)$ is included in the graph, draw a closed circle at that point.

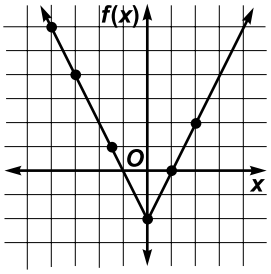
Second, graph the function $f(x) = 1 + x$ for $-2 < x \le 2$. Because $x = -2$ is not included in this region of the domain, draw an open circle at $(-2, -1)$. The value of $x = 2$ is included in the domain, so draw a closed circle at $(2, 3)$ since for $f(x) = 1 + x$, $f(2) = 3$.

Third, graph the line $f(x) = 2x$ for $x > 4$. Draw an open circle at $(4, 8)$ since for $f(x) = 2x$, $f(4) = 8$.

A piecewise function whose graph looks like a set of stairs is called a **step function**. One type of step function is the **greatest integer function**. The symbol $[\![x]\!]$ means *the greatest integer not greater than x*. The graphs of step functions are often used to model real-world problems such as fees for phone services and the cost of shipping an item of a given weight.

The **absolute value function** is another piecewise function. Consider $f(x) = |x|$. The absolute value of a number is always nonnegative.

Example 2 **Graph** $f(x) = 2|x| - 2$.

Use a table of values to determine points on the graph.

x	$2\|x\| - 2$	$(x, f(x))$
-4	$2\|-4\| - 2$	$(-4, 6)$
-3	$2\|-3\| - 2$	$(-3, 4)$
-1.5	$2\|-1.5\| - 2$	$(-1.5, 1)$
0	$2\|0\| - 2$	$(0, -2)$
1	$2\|1\| - 2$	$(1, 0)$
2	$2\|2\| - 2$	$(2, 2)$