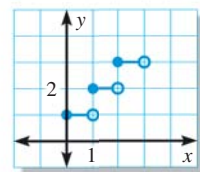


EXAMPLE 3 Write a piecewise function

Write a piecewise function for the graph shown.

**Solution**

For x between 0 and 1, including $x = 0$, the graph is the line segment given by $y = 1$.

For x between 1 and 2, including $x = 1$, the graph is the line segment given by $y = 2$.

For x between 2 and 3, including $x = 2$, the graph is the line segment given by $y = 3$. So, a piecewise function for the graph is as follows:

$$f(x) = \begin{cases} 1, & \text{if } 0 \leq x < 1 \\ 2, & \text{if } 1 \leq x < 2 \\ 3, & \text{if } 2 \leq x < 3 \end{cases}$$

STEP FUNCTIONS The piecewise function in Example 3 is called a **step function** because its graph resembles a set of stairs. A step function is defined by a constant value over each part of its domain. The constant values can increase with each “step” as in Example 3, or they can decrease with each step.

PRACTICE**EXAMPLE 1**

on p. 130
for Exs. 1–4

EVALUATING FUNCTIONS Evaluate the function below for the given value of x .

$$f(x) = \begin{cases} 9x - 4, & \text{if } x > 3 \\ \frac{1}{2}x + 1, & \text{if } x \leq 3 \end{cases}$$

1. $f(-4)$ 2. $f(2)$ 3. $f(3)$ 4. $f(5)$

EXAMPLE 2

on p. 130
for Exs. 5–8

GRAPHING FUNCTIONS Graph the function.

$$5. f(x) = \begin{cases} 2x + 1, & \text{if } x \geq 0 \\ -x + 1, & \text{if } x < 0 \end{cases} \quad 6. g(x) = \begin{cases} -\frac{1}{2}x - 1, & \text{if } x < 2 \\ 3x - 7, & \text{if } x \geq 2 \end{cases} \quad 7. h(x) = \begin{cases} 3, & \text{if } 0 < x \leq 2 \\ 1, & \text{if } 2 < x \leq 4 \\ 5, & \text{if } 4 < x \leq 6 \end{cases}$$

8. **POSTAL RATES** In 2005, the cost C (in dollars) to send U.S. Postal Service Express Mail up to 5 pounds depended on the weight w (in ounces) according to the function at the right.
- $$C(w) = \begin{cases} 13.65, & \text{if } 0 < w \leq 8 \\ 17.85, & \text{if } 8 < w \leq 32 \\ 21.05, & \text{if } 32 < w \leq 48 \\ 24.20, & \text{if } 48 < w \leq 64 \\ 27.30, & \text{if } 64 < w \leq 80 \end{cases}$$
- a. Graph the function.
- b. What is the cost to send a parcel weighing 2 pounds 9 ounces using Express Mail?

EXAMPLE 3

on p. 131
for Exs. 9–10

SPECIAL STEP FUNCTIONS Write and graph the piecewise function described using the domain $-3 \leq x \leq 3$.

9. **Rounding Function** The output $f(x)$ is the input x rounded to the nearest integer. (If the decimal part of x is 0.5, then x is rounded up.)
10. **Greatest Integer Function** The output $f(x)$ is the greatest integer less than or equal to the input x .