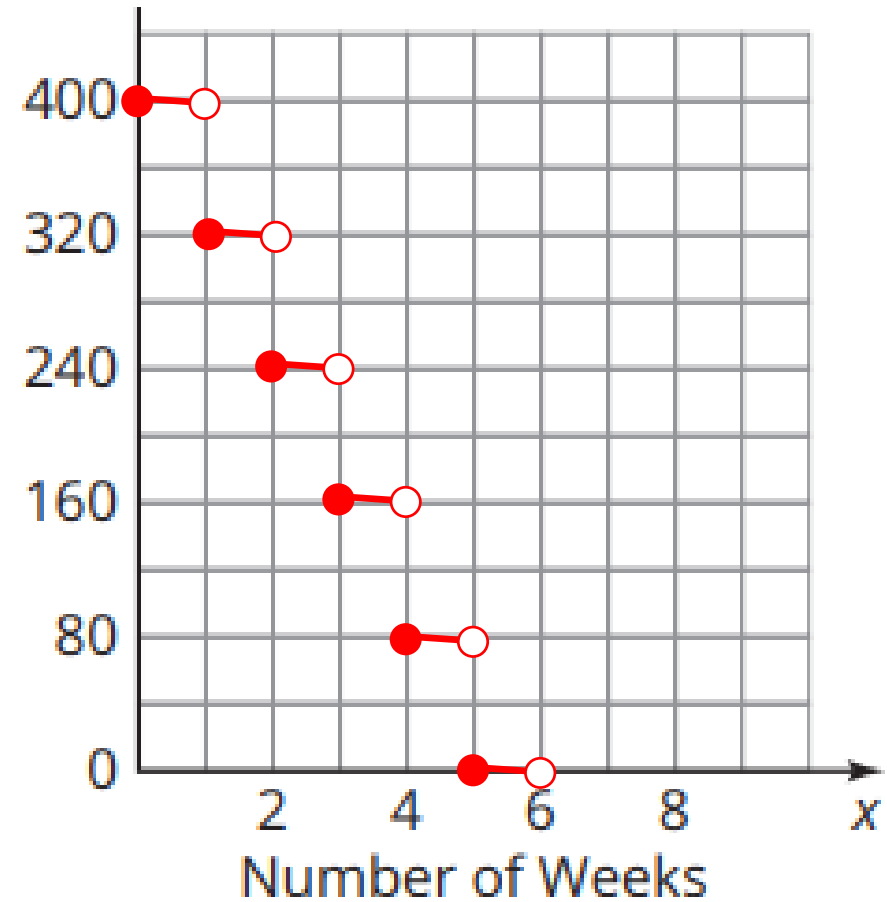


Robert borrowed \$400 from his older brother to take a weekend trip with his friends. A week after he returns from his trip, he will begin paying his brother \$80 per week until he has completely paid off his debt.

1. Define a piecewise function, $f(x)$, for the total amount of Robert's debt based on the number of weeks he pays his brother back. Then create a graph to represent the function.

$$f(x) = \begin{cases} 400 & 0 \leq x < 1 \\ 320 & 1 \leq x < 2 \\ 240 & 2 \leq x < 3 \\ 160 & 3 \leq x < 4 \\ 80 & 4 \leq x < 5 \\ 0 & x \geq 5 \end{cases}$$

Money Robert Owes His
Brother (dollars)



M3-58

The *greatest integer function* is a special linear piecewise function. The **greatest integer function**, also known as a **floor function**, $G(x) = \lfloor x \rfloor$, is defined as the greatest integer less than or equal to x .

1. Evaluate each expression using the greatest integer function.

a. $\lfloor 2 \rfloor = \underline{\quad 2 \quad}$

b. $\lfloor 0.17 \rfloor = \underline{\quad 0 \quad}$

c. $\lfloor 2.34 \rfloor = \underline{\quad 2 \quad}$

d. $\lfloor -1.2 \rfloor = \underline{\quad -2 \quad}$

e. $\lfloor 2.99999 \rfloor = \underline{\quad 2 \quad}$

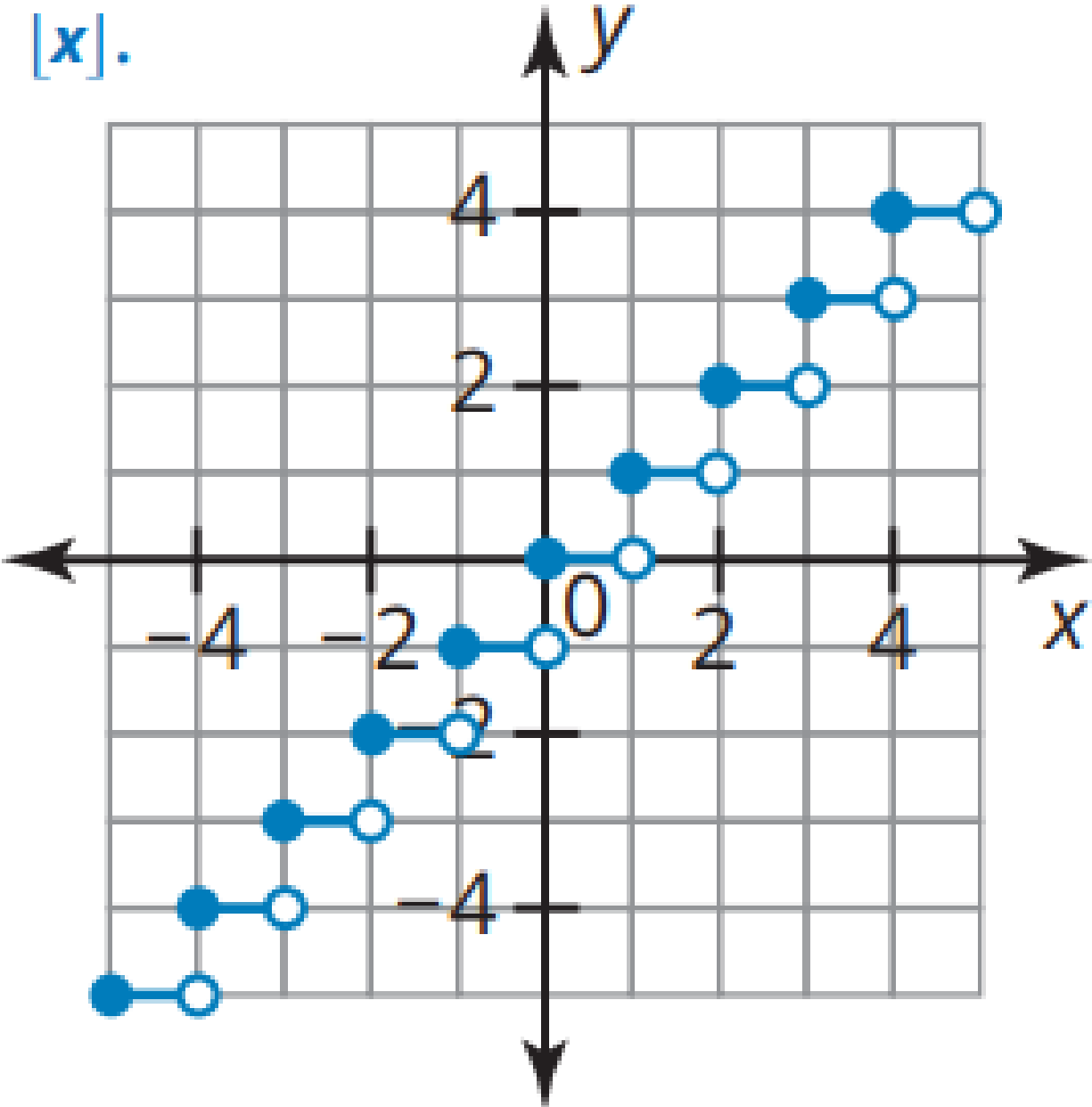
f. $\lfloor -0.2 \rfloor = \underline{\quad -1 \quad}$

2. Graph $G(x) = \lfloor x \rfloor$.



Round
Down!

2. Graph $G(x) = \lfloor x \rfloor$.



The *least integer function* is another special linear piecewise function. The **least integer function** $L(x) = \lceil x \rceil$, also known as the **ceiling function**, is defined as the least integer greater than or equal to x .

4. Evaluate each expression using the least integer function.

a. $\lceil 2 \rceil = \underline{\quad 2 \quad}$

b. $\lceil 0.17 \rceil = \underline{\quad 1 \quad}$

c. $\lceil 2.34 \rceil = \underline{\quad 3 \quad}$

d. $\lceil -1.2 \rceil = \underline{\quad -1 \quad}$

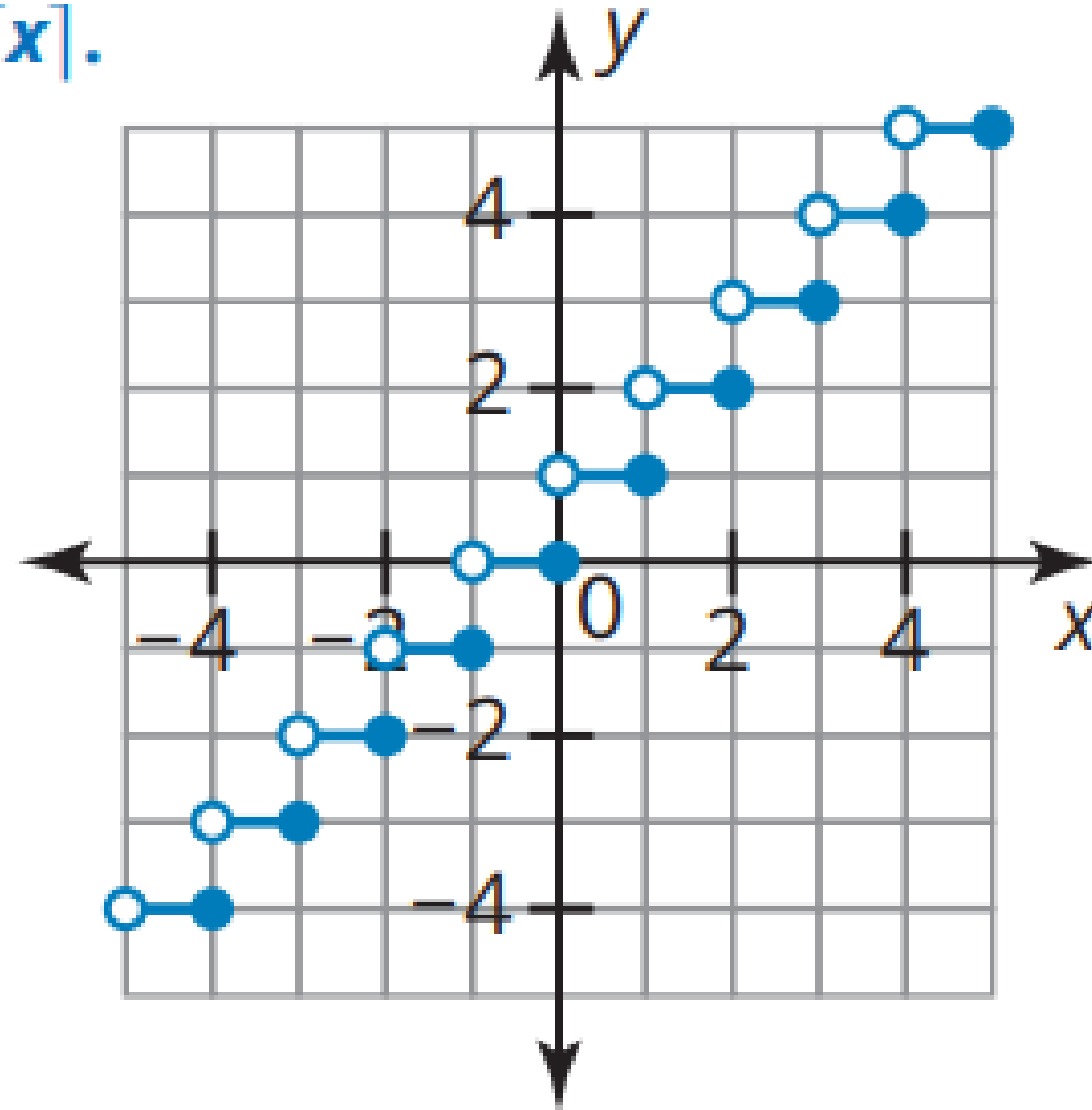
e. $\lceil 2.99999 \rceil = \underline{\quad 3 \quad}$

f. $\lceil -0.2 \rceil = \underline{\quad 0 \quad}$

Round
Up!

5. Graph $L(x) = \lceil x \rceil$.

M3-60



10. Determine whether each scenario identifies the greatest integer function, least integer function, or neither.

- a. Mark is parking his car in a garage that charges by the hour. When he parks there for 3.2 hours, he is charged for 4 hours. When he parks there for 3.9 hours, he is charged for 4 hours.**

Least integer function
(ceiling function)

- b. Tamara gets reward points for every dollar she spends at the mall. When she spent \$34.25, she received 34 reward points. When she spent \$15.95, she received 15 reward points.**

Greatest integer
function (floor
function)

- c. Julie's teacher records only whole number values in her gradebook. When Julie earned 88.3 points, the teacher recorded 88 points. When Julie earned 92.5 points, the teacher recorded 93 points.

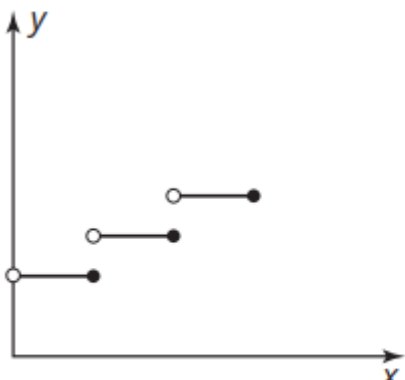
Neither

- d. The yogurt shop charges by the weight of the yogurt sundae you create. Everly is charged as if her 4.2-ounce sundae weighs 5 ounces, and Greyson is charged as if his 5.7-ounce sundae weighs 6 ounces.

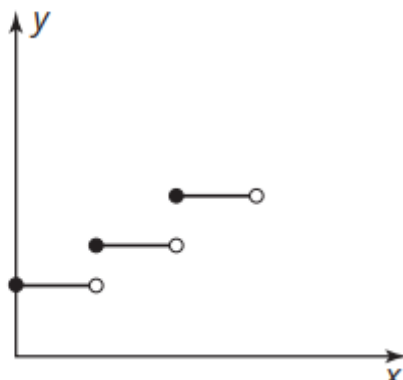
Least integer function
(ceiling function)

2. Which graph best represents this situation? Explain your reasoning.

Graph A



Graph B



3. Complete each statement using *always*, *sometimes*, or *never*.

a. Step functions are Always piecewise functions.

b. Piecewise functions are Sometimes step functions.

c. The graphs of step functions are Always discontinuous.

d. The graphs of piecewise functions are Sometimes discontinuous.