

## ALEGRBA RH

**Essential Question:** What are step functions? How are they defined, graphed and applied to real life situations?

**Do Now:**

Given the function below, what is the average rate of change over the interval  $-1 \leq x \leq 5$ ?

$$f(x) = \begin{cases} 3x+1 & x < 2 \\ -6x+10 & x \geq 2 \end{cases}$$

$3(-1)+1 \rightarrow (-1, -2)$        $\frac{\Delta y}{\Delta x} = \frac{-20 - (-2)}{5 - (-1)}$   
 $-6(5)+10 \rightarrow (5, -20)$        $= \frac{-18}{6}$   
 $= -3$

Consider the unique piecewise function below.

$$f(x) = \begin{cases} 2; & 0 \leq x < 5 \\ 6; & 5 \leq x \leq 10 \end{cases}$$

Evaluate each:

a.  $f(0)$

2

b.  $f(2)$

2

c.  $f(5)$

6

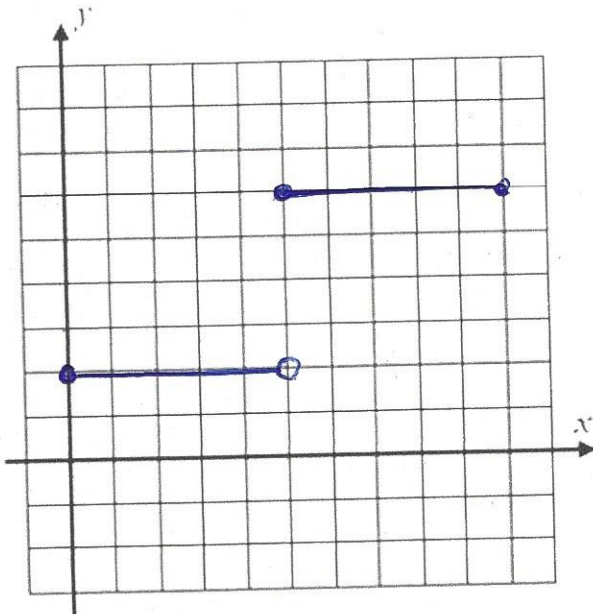
d.  $f(7)$

6

e.  $f(10)$

6

Graph the piecewise function below



A **step function** is a piecewise function containing all horizontal "pieces". This type of function resembles a set of steps and is **discontinuous** (cannot be drawn without removing your pencil from the paper)

Practice Problem Set

1. Given the step function below:

$$f(x) = \begin{cases} 2; & 0 \leq x < 3 \\ 5; & 3 \leq x < 5 \\ -4; & 5 \leq x \leq 10 \end{cases}$$

Evaluate each:

a.  $f(0)$

2

c.  $f(3.5)$

5

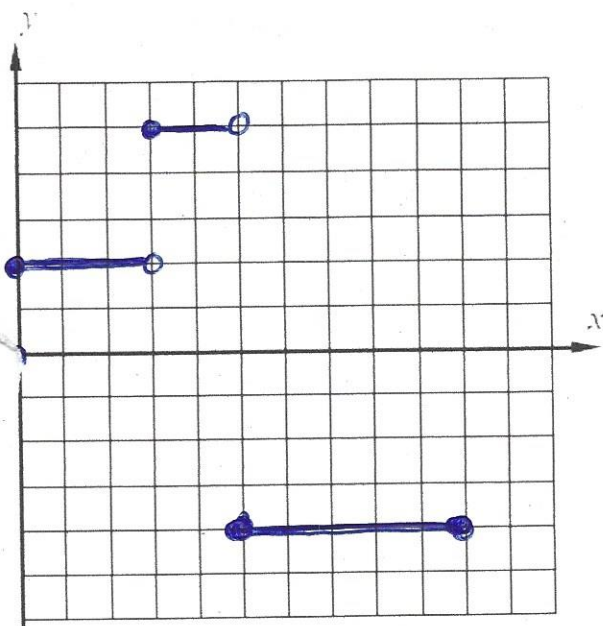
b.  $f(2.7)$

2

d.  $f(5)$

-4

Graph the step function below.



What is the domain and range of this function?

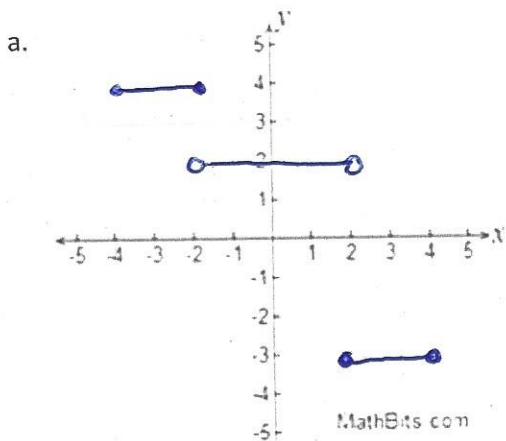
Domain:  $[0, 10]$

$0 \leq x \leq 10$

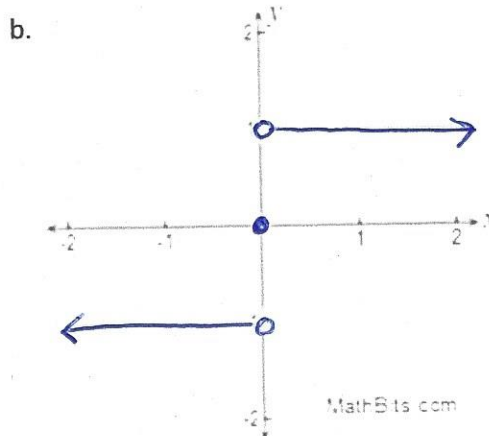
Range:  $\{-4, 2, 5\}$

$y = -4, 2, 5$

2. Define each step function shown below.

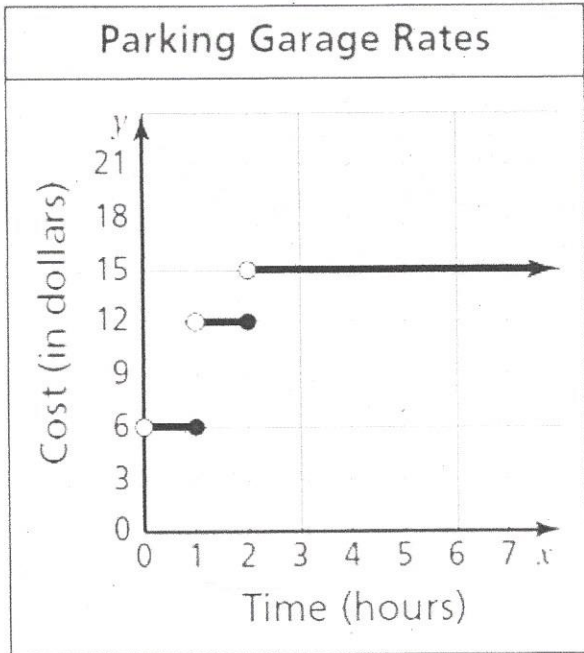


$$f(x) = \begin{cases} 4; & -4 \leq x \leq -2 \\ 2; & -2 < x < 2 \\ -3; & 2 \leq x \leq 4 \end{cases}$$



$$f(x) = \begin{cases} -1; & x < 0 \\ 0; & x = 0 \\ 1; & x > 0 \end{cases}$$

3. The graph shows the parking rates for a garage in NYC.



a. How much does it cost to park for 30 minutes?

\$ 6

b. A person checks in at 5:45 pm and checks out at 7:45. What do they owe the garage?

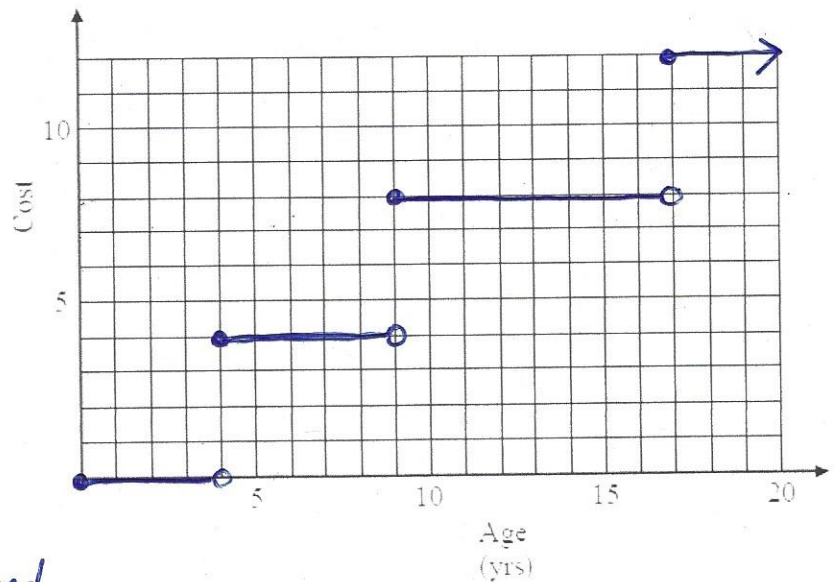
5:45 to 7:45 \$ 12  
2 hours

c. If a person pays \$15 for parking, how many hours did they park for?

more than 2 hours

4. A local amusement park charges the admission fee based on age. Graph the amount of money a person would have to pay for admission based on their age.

Age Range	Price
3 and under	Free
8 and under	\$4.00
16 and under	\$8.00
17 and older	\$12.00



the day before your 4th birthday, you are still considered to be 3 years old  
 $0 \leq x < 4$