

Essential Questions: What are step functions? How are they graphed?

Do Now:

(1) Consider the piecewise (step) function given by $f(x) = \begin{cases} 2 & 0 \leq x < 5 \\ 6 & 5 \leq x \leq 10 \end{cases}$

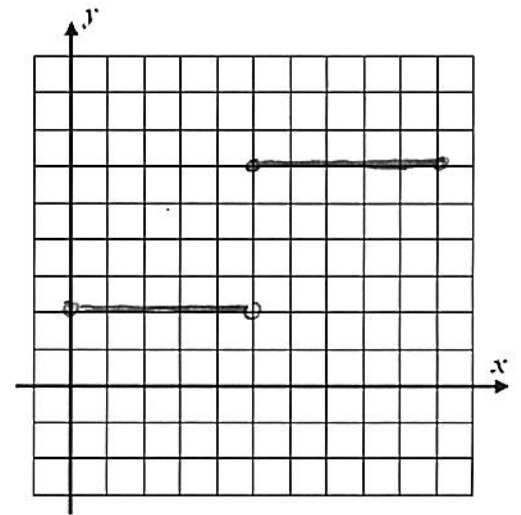
(a) Evaluate each of the following. After you do your evaluation, write down what coordinate point must lie on the graph as a result of the calculation.

$$f(0) = 2 \quad f(2) = 2 \quad f(4) = 2$$

$$(0, 2) \quad (2, 2) \quad (4, 2)$$

$$f(5) = 6 \quad f(7) = 6 \quad f(10) = 6$$

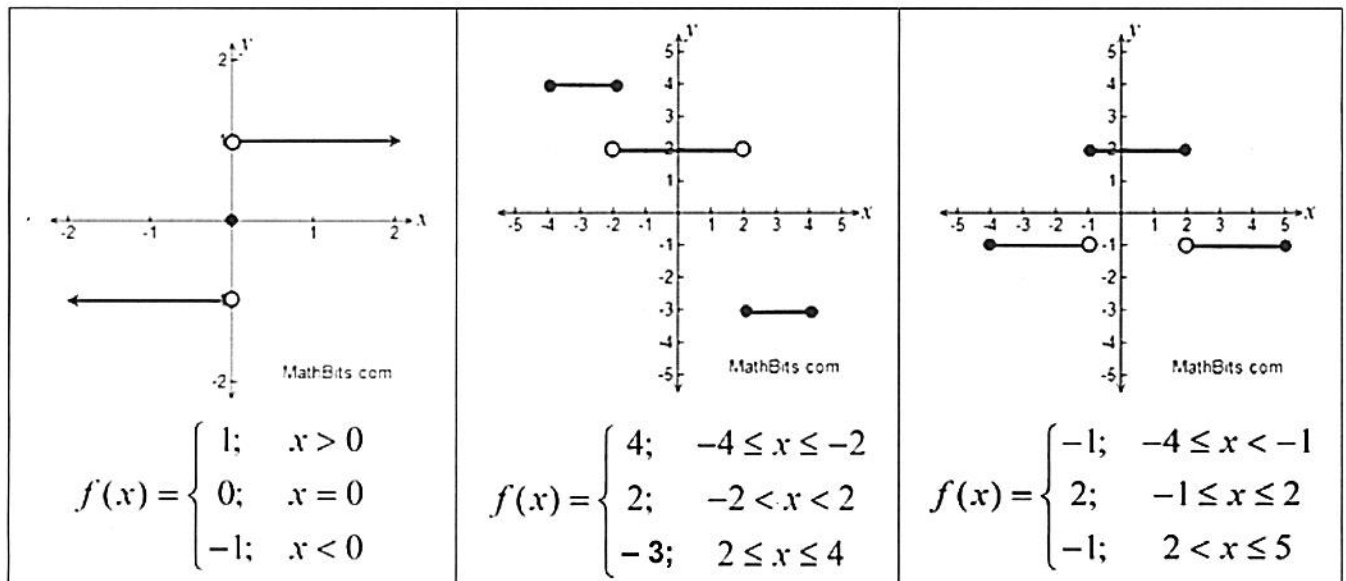
$$(5, 6) \quad (7, 6) \quad (10, 6)$$



(b) Graph the step function on the grid to the right.

STEP FUNCTIONS

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



(2) A step function is defined using the piecewise formula

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

(a) Evaluate the following:

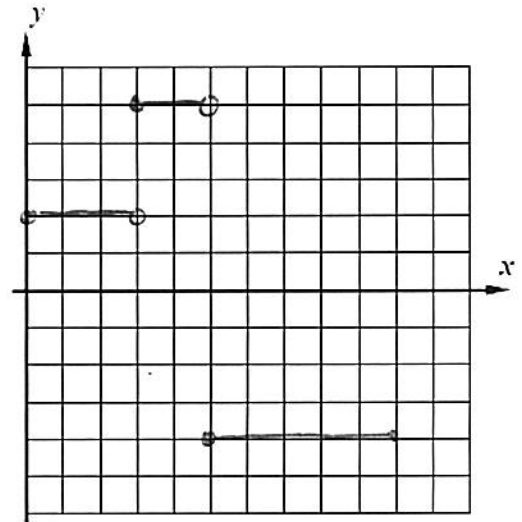
$$f(2.7) = 2 \qquad f(5) = -4$$

$$f(3.5) = 5 \qquad f(0) = 2$$

(b) Graph $f(x)$ on the grid to the right.

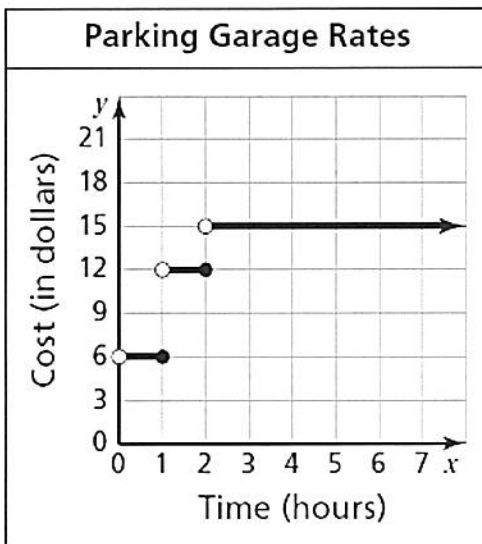
domain : $0 \leq x \leq 10$
 $[0, 10]$

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



Let's take a look at these functions in the context of a situation.

The graph shows the rates for parking in a city parking garage.



A) How much does it cost to park for 30 minutes?

$$\$ 6$$

B) How much will it cost if someone is planning to park for 4 hours?

$$\$ 15$$

C) If a person pays \$15 for parking, how many hours has he/she parked?

more than 2 hours

D) Create a sign for the parking rates based on this graph.

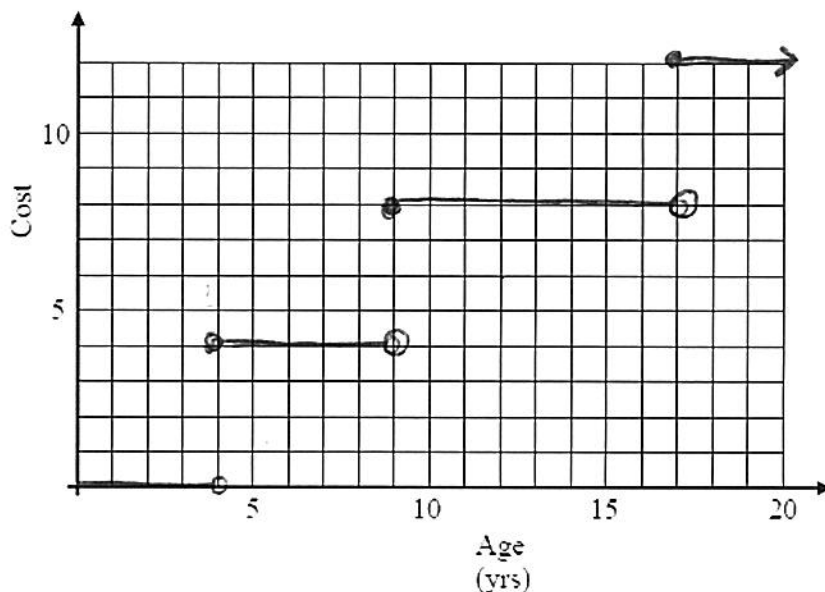
Parking Rates		
•	1 hour or less	\$6.00
•	over 1 hour to 2 hours	\$12.00
•	over 2 hours	\$15.00

or up to 1 hour

Applications with Piecewise Functions

- (1) At a local amusement park, the park charges an admission based on age. Graph the amount of money a person would have to pay for admission based on their age. Remember that someone who is one day short of 4 years old can consider themselves three and under.

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



- (2) Erin buys gas at a self-service station for \$2.75 a gallon. The gas station has a promotion going on that anyone who buys more than 10 gallons of gas, only has to pay \$2.50 per gallon. Erin's tank will hold 12 gallons of gas.

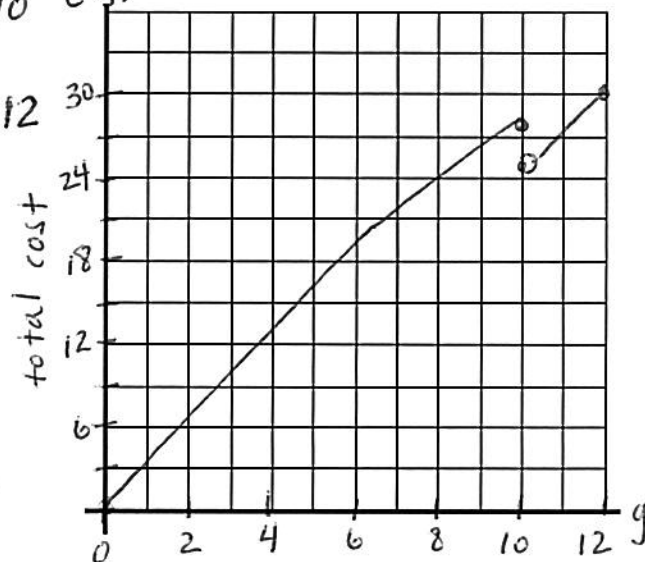
a) Write a rule for the ^(for Erin) total cost, $C(g)$ as a function of g gallons of gas.

$$C(g) = \begin{cases} 2.75g & ; 0 \leq g \leq 10 \\ 2.50g & ; 10 < g \leq 12 \end{cases}$$

b) Graph the piecewise function.

g	$C(g)$
0	0
10	27.5

g	$C(g)$
10	25
11	27.50
12	30



c) What is the domain and range of the function?

$$d: [0, 12]$$

$$r: [0, 30]$$

of gallons of gas