Unit 8: Formulas and Functions

Section 8.1: Words and Formulas

Section 8.2: Formulas in Function Notation

Section 8.3: Formulas in Function Notation – Applications

Section 8.4: Graphing Functions

Section 8.5: Connecting Representations

Section 8.6: Applications

KEY TERMS AND CONCEPTS	
Look for the following terms and concepts as you work through the Media Lesson. In the space below, explain the meaning of each of these concepts and terms *in your own words*. Provide examples that are not identical to those in the Media Lesson.	
Input	
Output	
Function Notation	

Ordered Pair	
Symbolic Rule	
Verbal Description of a Function	
Four Representations of a Function	
Compare: Find $f(4)$ Find x when $f(x) = 4$	

Unit 8: Media Lesson

Section 8.1: Words and Formulas

Example 1: Complete the table below.

Symbolic Rule	Verbal Description
$h(x) = x - 5$	
$k(x) = 5 - x$	
$r(a) = \|a\|$	
$S(t) = -t$	
	The function $f(x)$ divides the input by 5.
	The function $g(x)$ adds 7 to the input.
	The function $c(t)$ squares the input.
	The function $p(n)$ adds 1 to the input, then doubles the result
	The function $q(w)$ doubles the input, then adds 1

Section 8.1 – You Try

Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = x^2 - 5$	
	The function $p(n)$ multiplies the input by 5 then subtracts that result from 11

Section 8.2: Formulas in Function Notation

Example 1: Let $f(x) = x^2 - 2x + 11$

a. Determine $f(-3)$

b. Determine $f(0)$

Example 2: Let $h(x) = 2x - 5$

a. Determine $h(4)$

b. For what value of x is $h(x) = 17$?

 **Example 3:** Let $g(x) = 71$

a. Determine $g(5)$.

b. Determine $g(-40)$.

Section 8.2 – You Try

 Let $r(a) = 4 - 5a$. Show all steps as in the media examples. Write each answer using function notation **and** as an ordered pair.

a. Determine $r(-2)$.

b. For what value of a is $r(a) = 19$?

Section 8.3: Formulas in Function Notation – Applications

Example 1: Grace is selling snow cones at a local carnival. Her profit, in dollars, from selling x snow cones is given by the function $P(x) = 2.5x - 30$.

a. Write a complete sentence to explain the meaning of $P(30) = 45$ in words.

b. Determine $P(10)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

c. Determine $P(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

d. Determine x when $P(x) = 100$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

e. Determine x when $P(x) = 0$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

Section 8.3 – You Try

The function $T(a) = 0.7(220 - a)$, gives the target heart rate, in beats per minute, for a person who is a years of age.

a. Write a complete sentence to explain the meaning of $T(30) = 133$ in words.

b. Determine $T(50)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

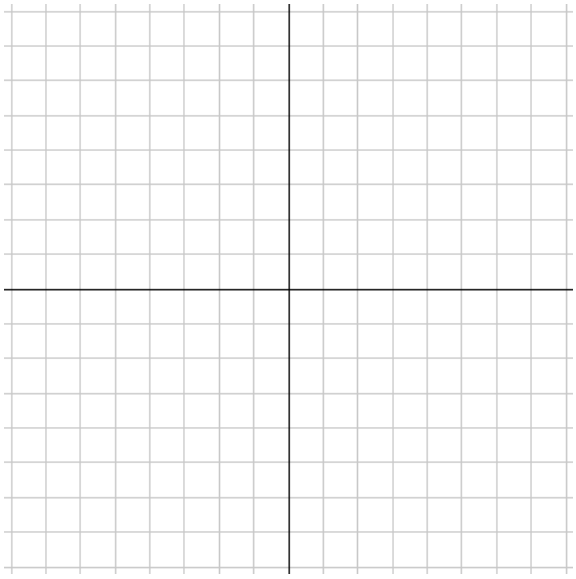
c. Determine a when $T(a) = 140$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

Section 8.4: Graphing Functions

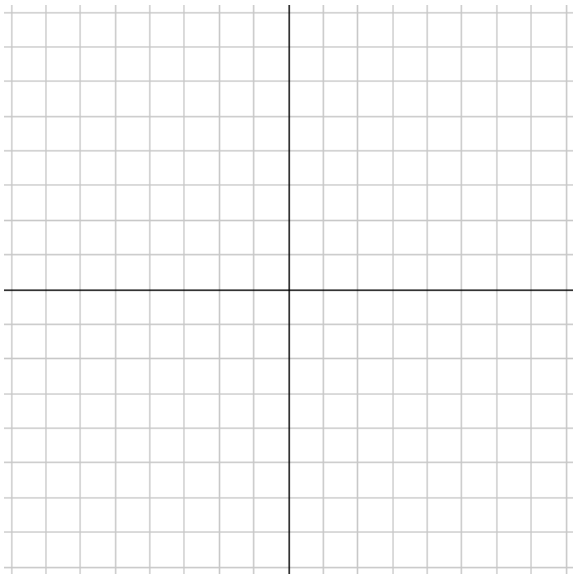
Example 1: Graph the function $S(t) = 4 - 2t$

t	$S(t)$	Ordered Pair



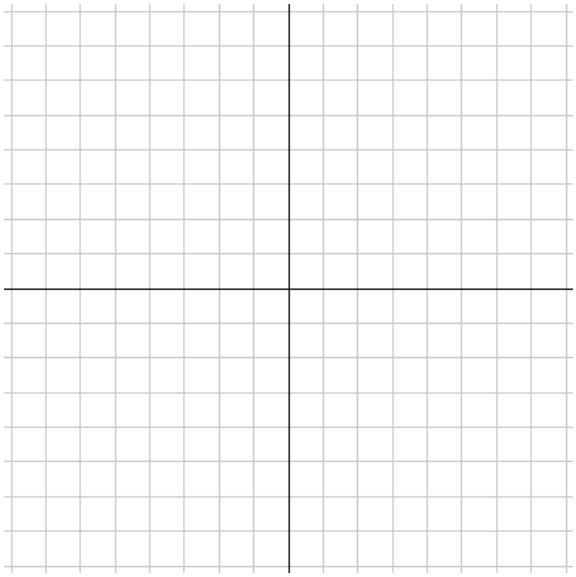
Example 2: Graph the function $f(x) = x^2 - 3$

x	$f(x)$	Ordered Pair



Example 3: Graph the function $p(r) = 5$

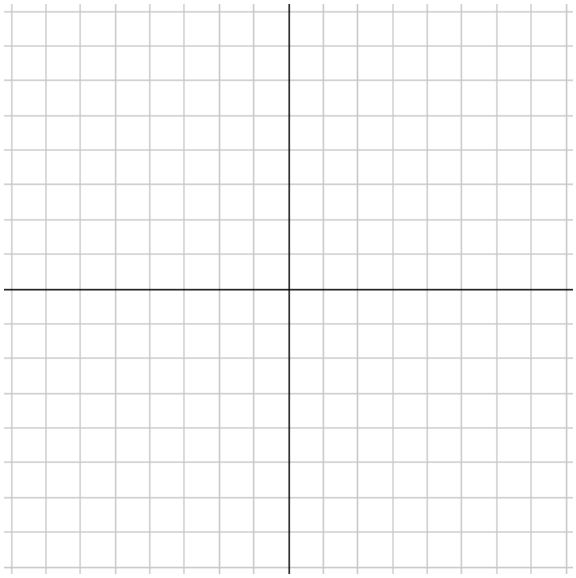
r	$p(r)$	Ordered Pair



Section 8.4 – You Try

Graph the function $f(x) = 5 - x$

x	$f(x)$	Ordered Pair



Section 8.5: Connecting Representations

Example 1: Identify the pattern from the table, and use that information to construct the graph and determine the formula for the function $g(x)$. Then use words to describe the relationship between the input and output variables.

x	$g(x)$	Ordered Pair
-3	-6	
-2	-4	
-1	-2	
0	0	
1	2	
2	4	
3	6	

Symbolic Rule: $g(x) =$ _____

In words:

Example 2: Use the formula for $H(t)$ to complete the table. Graph the results. Then use words to describe the relationship between the input and output variables.

Symbolic Rule: $H(t) = |t|$

t	$H(t)$	Ordered Pair
–3		
–2		
–1		
0		
1		
2		
3		

In words:

Example 3: Use the description of the function $f(x)$ to complete the table. Graph the results and determine a symbolic rule for the function $f(x)$.

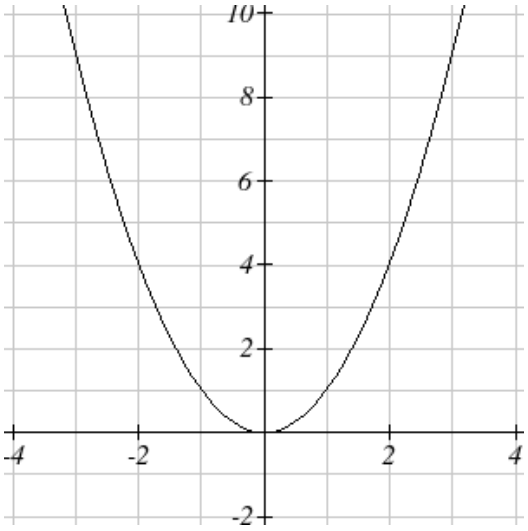
The function f(x) doubles the input value, then adds 5 to the result.

x	$f(x)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		

Symbolic Rule: $f(x)$= _____

Example 4: Refer to the graph of $k(n)$ to complete the table of values. Determine the formula for the function $k(n)$, then use words to describe the relationship between the input and output variables.

n	$k(n)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



Symbolic Rule: $k(n)$ = _____

In words:

Section 8.5 – You Try

Identify the pattern from the table, and use that information to construct the graph and determine the formula for the function $g(t)$. Then use words to describe the relationship between the input and output variables.

t	$g(t)$	Ordered Pair
-3	-1	
-2	0	
-1	1	
0	2	
1	3	
2	4	
3	5	

Symbolic Rule: $g(t) =$ _____

In words:

Section 8.6: Applications

Example 1: A local towing company charges $3.25 per mile driven plus a nonrefundable base fee of $30.00. They tow a maximum of 25 miles.

a. Write a formula for the function $C(x)$ which represents total cost as a function of the number of miles driven.

b. Determine C(15). Write your answer as ordered pair then explain its meaning in a complete sentence.

c. Determine the value of x when $C(x) = 82$. Write your answer as ordered pair then explain its meaning in a complete sentence.

d. Identify the practical domain and practical range of this function by filling in the blanks below. Include units in your answers.

Practical Domain: _____ $\leq x \leq$ _____

Practical Range: _____ $\leq C(x) \leq$ _____

e. Construct a table of values and draw a good graph of $C(x)$

x	$C(x)$

Section 8.6 – You Try

The value, in dollars, of a washer/dryer set decreases as a function of time t in years. The function $V(t) = -125t + 1500$ models this situation. You own the washer/dryer set for 12 years.

a. Determine V(5). Show your work. Write your answer as ordered pair then explain its meaning in a complete sentence.

b. Determine the value of t when $V(t) = 500$. Show your work. Write your answer as ordered pair then explain its meaning in a complete sentence.

c. Identify the practical domain and practical range of this function by filling in the blanks below. Include units in your answers.

Practical Domain: _____ $\leq t \leq$ _____

Practical Range: _____ $\leq V(t) \leq$ _____

d. Construct a table of values and draw a good graph of $V(t)$

t	$V(t)$

Unit 8: Practice Problems

Skills Practice

1. Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = x + 8$	
$g(x) = 7 - x$	
$k(a) = 5a$	
$S(r) = 2r - 9$	
	The function $r(x)$ multiplies the input by -8
	The function $m(x)$ subtracts 3 from the input.
	The function $c(v)$ subtracts the input from 6.
	The function $p(t)$ adds 5 to the input, then divides the result by 4
	The function $q(w)$ divides the input by 4, then adds 5

2. Let $W(p) = 4p^2 - 9p + 1$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine W(5) .

   b. Determine W(0).

   c. Determine W(–1).

   d. Determine W(–10).

3. Let $k(m) = 8 - 3m$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $k(5)$.

   b. Determine $k(-3)$

   c. For what value of m is $k(m) = 29$?

   d. For what value of m is $k(m) = 0$?

4. Let $R(t) = 1500 + 40t$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $R(18)$.

   b. For what value of t is $R(t) = 3000$?

5. Let $h(x) = 4$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $h(5)$.

   b. Determine $h(81)$.

6. Let $b(w) = \sqrt{w+3}$. Show all steps. Write each answer in function notation *and* as an ordered pair. Round to the nearest hundredth as needed.

   a. Determine $b(1)$.

   b. Determine $b(8)$.

   c. Determine $b(-3)$.

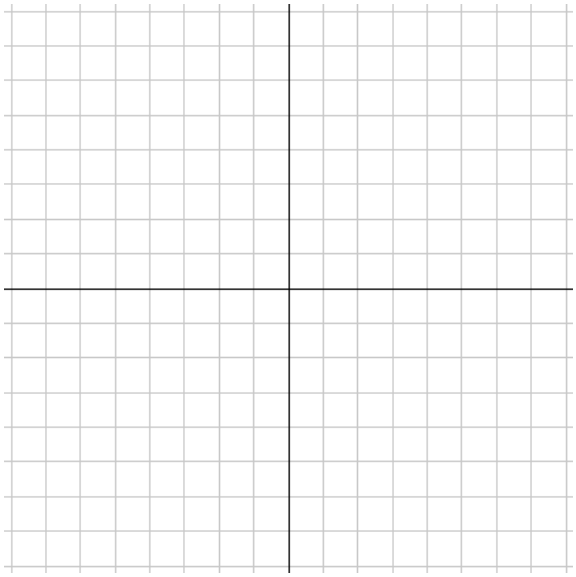
7. Let $p(x) = \frac{45}{2x}$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $p(5)$.

   b. Determine $p(-6)$.

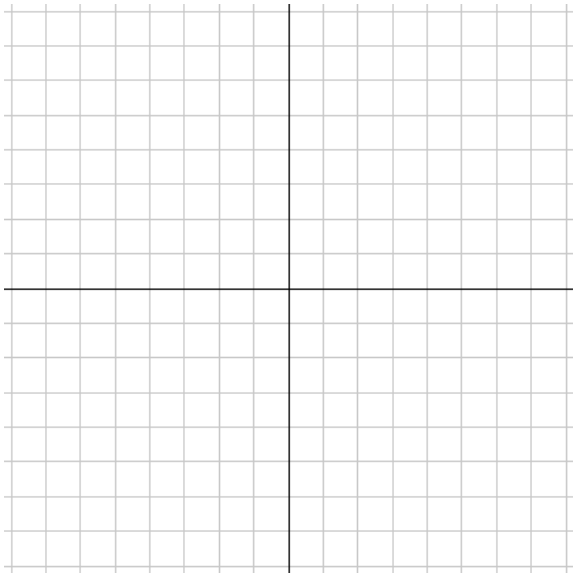
8. Graph the function $S(t) = t + 4$.

t	$S(t)$	Ordered Pair



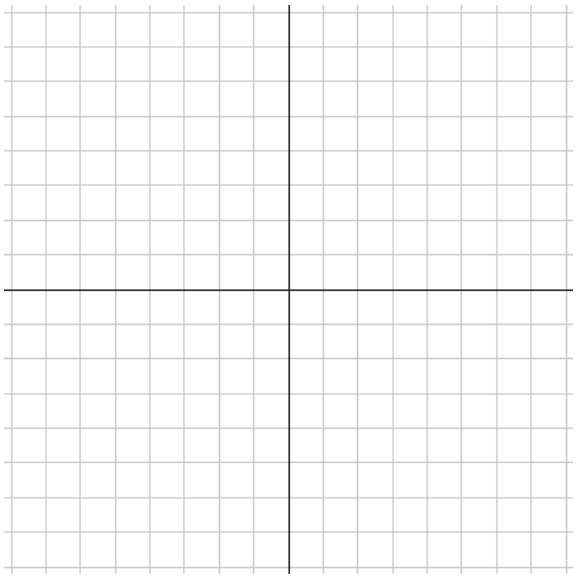
9. Graph the function $f(x) = 4 - 2x$.

x	$f(x)$	Ordered Pair



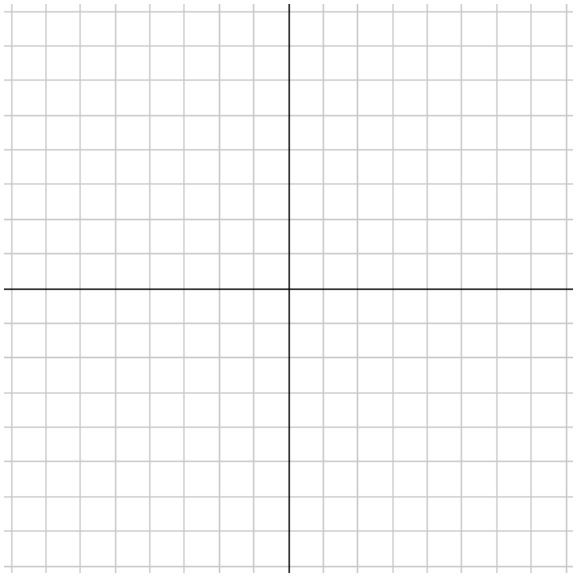
10. Graph the function $p(r) = 3$

r	$p(r)$	Ordered Pair



11. Graph the function $f(x) = x$

x	$f(x)$	Ordered Pair



12. Identify the pattern from the table, and use that information to construct the graph and determine the formula for the function $g(x)$. Then use words to describe the relationship between the input and output variables.

x	$g(x)$	Ordered Pair
-3	3	
-2	2	
-1	1	
0	0	
1	-1	
2	-2	
3	-3	

Symbolic Rule: $g(x) =$ _____

In words:

13. Use the formula for $H(t)$ to complete the table. Graph the results. Then use words to describe the relationship between the input and output variables.

Symbolic Rule: $H(t) = 5 - t^2$

t	$H(t)$	Ordered Pair
–3		
–2		
–1		
0		
1		
2		
3		

In words:

14. Use the description of the function $f(x)$ to complete the table. Graph the results and determine a symbolic rule for the function $f(x)$. Then use words to describe the relationship between the input and output variables.

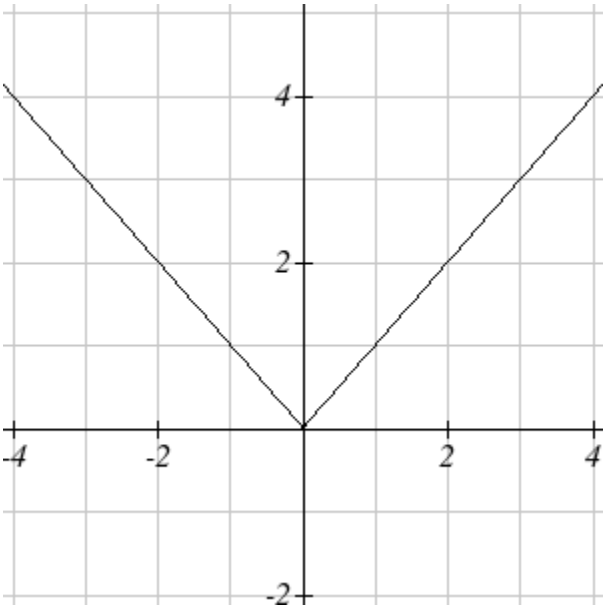
The function f(x) subtracts 3 from the input.

x	$f(x)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		

Symbolic Rule: $f(x) =$ _____

15. Refer to the graph of $k(n)$ to complete the table of values. Determine the formula for the function $k(n)$, then use words to describe the relationship between the input and output variables.

n	$k(n)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



Symbolic Rule: $k(n) =$ _____

In words:

Applications

16. A rock is dropped from the top of a building. The function $h(t) = 100 - 16t^2$ gives the height (measured in feet) of the rock after t seconds .

a. Complete the table below.

t	0	0.5	1	1.5	2	2.5
$h(t)$						

b. Is this function increasing or decreasing? _____

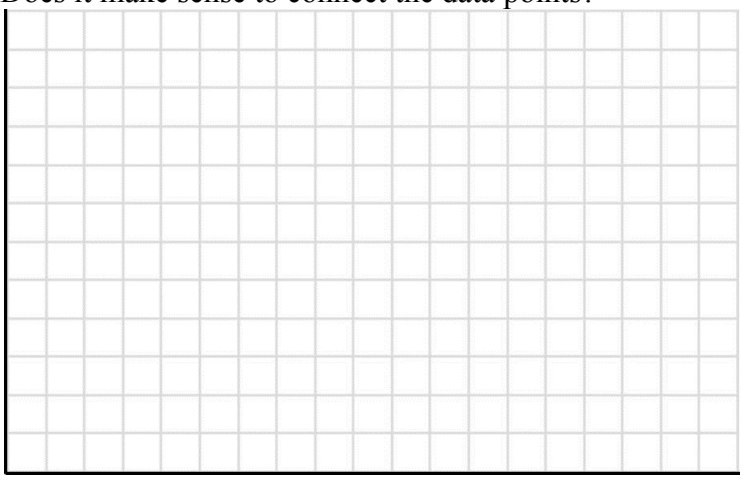
c. Determine $h(1)$. Write a sentence explaining the meaning of your answer.

d. For what value of t is $h(t) = 0$? Explain the meaning of your answer.

e. Determine the practical domain _____

f. Determine the practical range _____

g. Construct a good graph of $h(t)$. Does it make sense to connect the data points?



17. John is a door to door vacuum salesman. His weekly salary, in dollars, is given by the linear function $S(v) = 200 + 50v$, where v is the number of vacuums sold.

a. Determine $S(12)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

b. Determine $S(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

c. Determine v when $S(v) = 500$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: _____

18. The function $P(n) = 455n - 1820$ represents a computer manufacturer's profit, in dollars, when n computers are sold.

    a. Write a complete sentence to explain the meaning of $P(5) = 455$ in words.

    b. Determine $P(10)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: _____

    c. Determine $P(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: _____

    d. Determine x when $P(n) = 0$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: _____

19. The function $V(n) = 221.4 + 4.25n$ gives the value, in thousands of dollars, of an investment after n years. Determine $V(20)$, and write a sentence explaining the meaning of your answer.

20. The function $E(t) = 3861 - 77.2t$ gives the surface elevation (in feet above sea level) of Lake Powell t years after 1999.

    a. Determine E(0), and write a sentence explaining the meaning of your answer.

    b. Determine E(4), and write a sentence explaining the meaning of your answer.

    c. This function accurately models the surface elevation of Lake Powell from 1999 to 2005. Determine the practical range of this linear function.

Extension

21. For a part-time student, the cost of tuition at a local community college is \$85 per credit hour. The function C(n) gives the tuition cost for n credit hours. As a part-time student, Gabe can take a maximum of 11 credit hours.

    a. Identify the input variable in this situation:_____

    b. Identify the output variable in this situation:_____

    c. Write a formula (symbolic rule) for the function C(n): C(n) = _____

    d. Complete the table below and construct a properly scaled and labeled graph of C(n).

n	$C(n)$
0	
1	
2	
3	
5	
8	
11	

    e. Does it make sense to connect the points on the graph? Why or why not?

    f. Determine the practical domain of C(n):_____

    g. Determine the practical range of C(n): _____

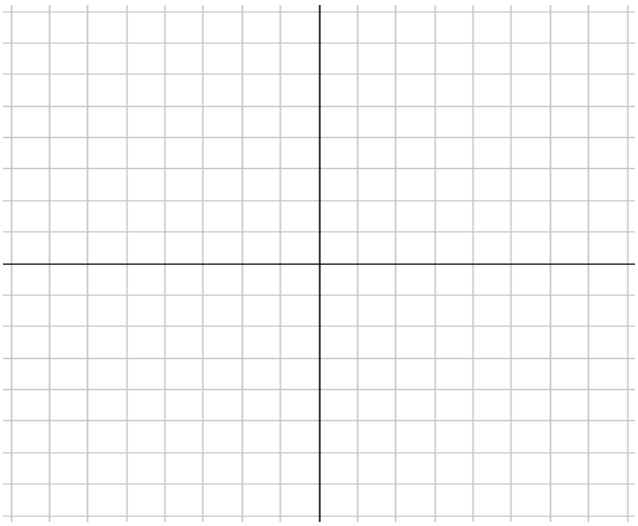
Unit 8: Review

1. Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = 3x + 5$	
	The function $g(x)$ squares the input, then multiplies that result by 2

2. Graph the function $p(r) = 3 - r$

r	$p(r)$	Ordered Pair



3. A local towing company charges \$5.50 for each mile plus a reservation fee of \$12. They tow a maximum of 30 miles.

   a. Write a formula for the function $C(x)$, representing the total cost to tow the car x miles.

   b. Determine $C(8)$. Show your work. Write your answer as an ordered pair and interpret its meaning in a complete sentence.

   c. Determine x when $C(x) = 100$. Show your work. Write your answer as an ordered pair and interpret its meaning in a complete sentence.

   d. Practical domain (include units): _____ $\leq x \leq$ _____

   e. Practical range (include units): _____ $\leq C(x) \leq$ _____

   f. Construct a good graph of $C(x)$.