

## Chapter 3: Introduction to Functions and Relations

### Section 3.1: Point-Slope Formula and Review of Graphing

#1 - 16: Find the x- and y-intercepts (when possible) and graph.

1)  $2x + 3y = 12$

2)  $3x + 4y = 24$

3)  $x - 3y = 6$

4)  $2x - y = 8$

5)  $3x + 2y = 0$

6)  $x + 2y = 0$

7)  $3x - y = 0$

8)  $4x + 3y = 0$

9)  $x = 6$

10)  $x = -3$

11)  $2x = -14$

12)  $3x = -12$

13)  $y = 3$

14)  $y = 4$

15)  $y + 3 = 0$

16)  $y - 4 = 0$

#17 - 28: Write the slope-intercept form ( $y = mx + b$ ) of the line, then identify the slope and y-intercept.

17)  $2x + y = 10$

18)  $3x + y = 4$

19)  $x - y = 1$

20)  $3x - y = 5$

21)  $2x + 4y = 16$

22)  $3x + 12y = 36$

23)  $x - 2y = 0$

24)  $3x - 5y = 0$

25)  $3x = 5 - 2y$

26)  $7x = 3 - 5y$

27)  $\frac{1}{3}x + \frac{2}{5}y = 4$

28)  $\frac{2}{5}x + \frac{1}{4}y = 3$

#29 - 34: Find the slope of the line that passes through the given points.

29) (1,4) and (3,5)

30) (3,1) and (4, -1)

31) (-2, -4) and (5, -3)

32) (2, -7) and (-5,-6)

33)  $\left(\frac{1}{2}, \frac{2}{3}\right)$  and  $\left(\frac{3}{2}, \frac{5}{6}\right)$

34)  $\left(\frac{1}{3}, \frac{2}{5}\right)$  and  $\left(\frac{3}{2}, \frac{1}{6}\right)$

Problems 35 – 42 have been deleted.

## Chapter 3: Introduction to Functions and Relations

### Section 3.1: Point-Slope Formula and Review of Graphing

#43-60: Find the equation of a line in slope intercept form with given properties

- 43) The slope is -3 and the line passes through (5, 6)
- 44) The slope is 4 and the line passes through (-1,3)
- 45) The slope is  $\frac{2}{3}$  and the line passes through (-2,5)
- 46) The slope is  $\frac{2}{5}$  and the line passes through (-1,3)
- 47) The slope is 0 and the line passes through (1,5)
- 48) The slope is 0 and the line passes through (-1,2)
- 49) The line passes through the points (4,5) and (5,1)
- 50) The line passes through the points (6,3) and (7, 10)
- 51) The line passes through the points (5,1) and (2, 9)
- 52) The line passes through the points (-3,8) and (-5,9)
- 53) The line passes through the point (1,5) and is perpendicular to the line  $y = 3$ .
- 54) The line passes through the point (2,1) and is perpendicular to the line  $y = 5$ .
- 55) The line passes through the point (-3,4) and is parallel to the line  $y = 2$ .
- 56) The line passes through the point (-4,-6) and is parallel to the line  $y - 1$ .
- 57) The line passes through the points (1,2) and (1,3)
- 58) The line passes through the points (2,3) and (2,5)
- 59) The line passes through the points (1,2) and (3,2)
- 60) The line passes through the points (5,4) and (7,4)

# Chapter 3: Introduction to Functions and Relations

## Section 3.2: Introduction to Relations

#1 - 4: Write each relation as a set of ordered pairs then list the domain and range of each relation.

1)

Group (x)	Group (y)
Atlanta	Falcons
Phoenix	Cardinals
Detroit	Lions

2)

Group (x)	Group (y)
A	W
B	X
C	Y
D	Z

3)

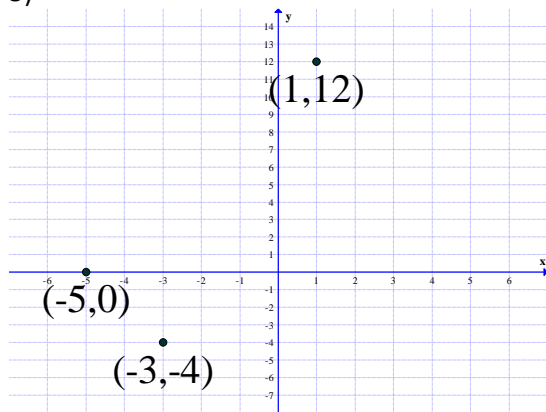
Group (x)	3	4	5	6	7
Group (y)	1	1	3	5	8

4)

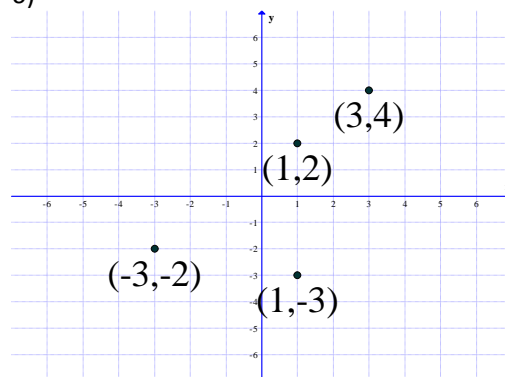
Group (x)	1	1	5	9	8
Group (y)	1	2	4	2	1

#5 - 14: Find the domain and range of the relations. Write your answer in interval notation, when appropriate.

5)



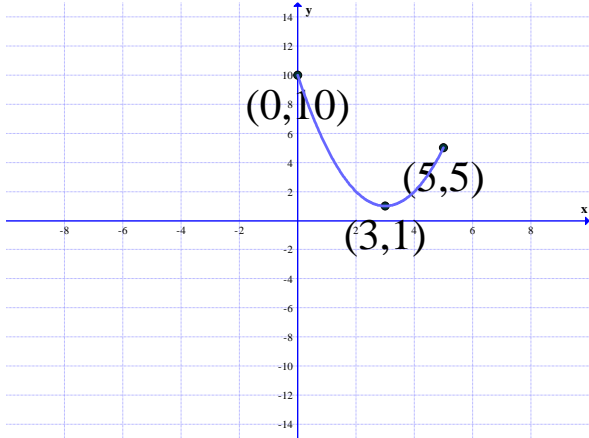
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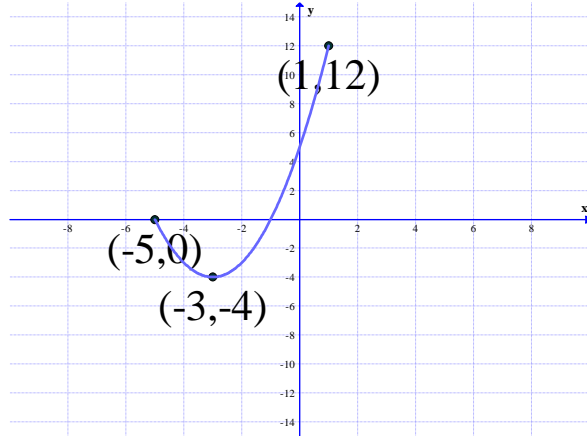
# Chapter 3: Introduction to Functions and Relations

## Section 3.2: Introduction to Relations

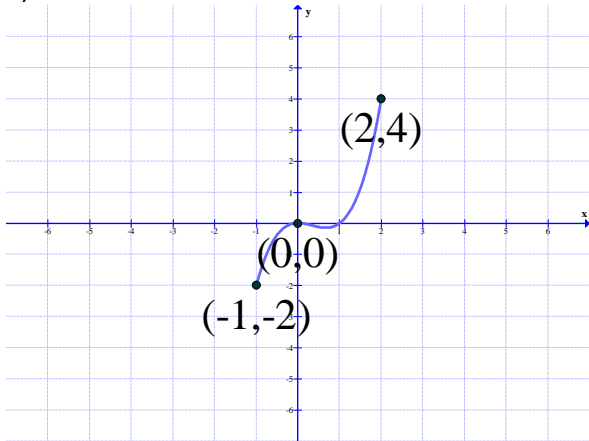
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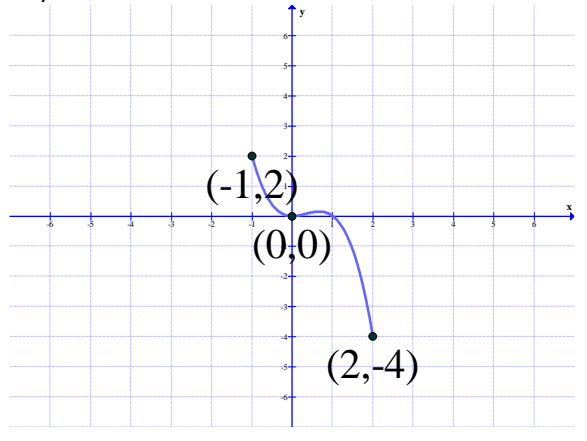
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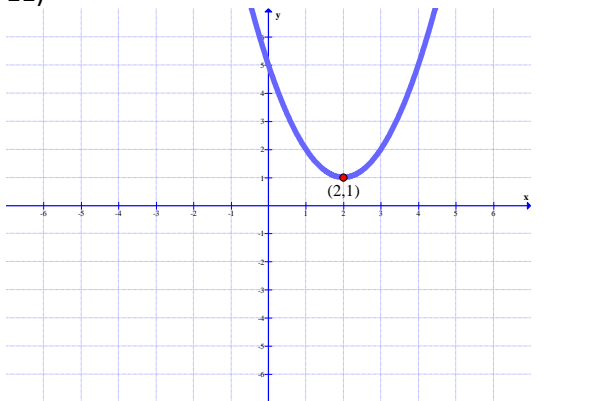
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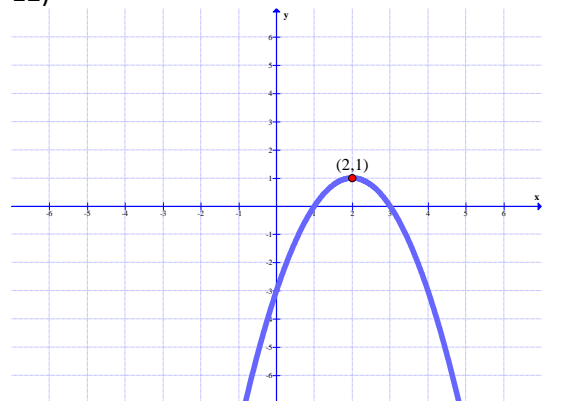
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11)



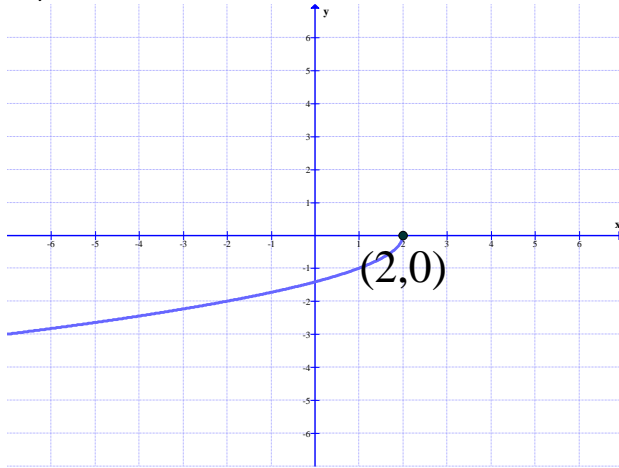
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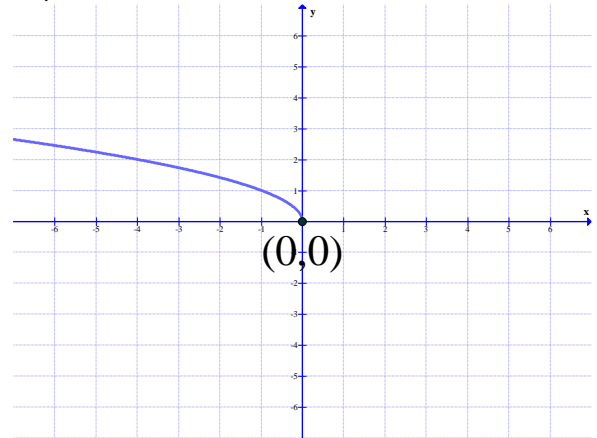
# Chapter 3: Introduction to Functions and Relations

## Section 3.2: Introduction to Relations

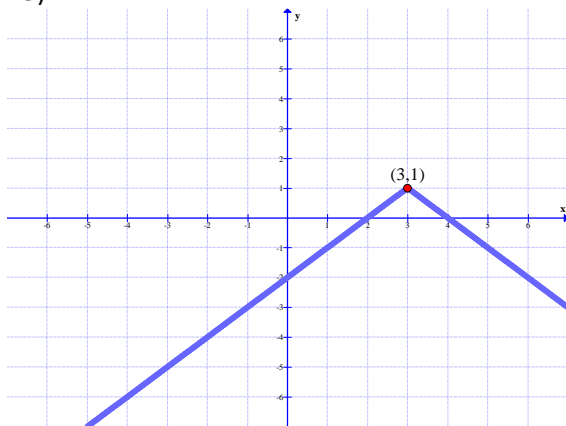
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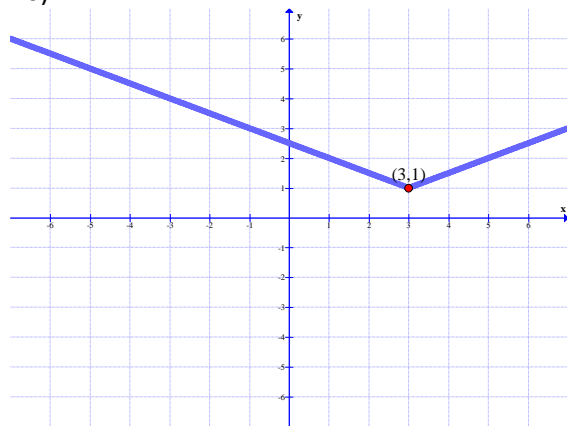
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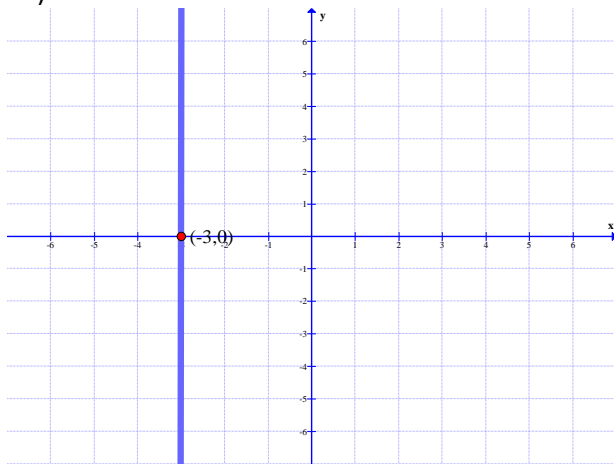
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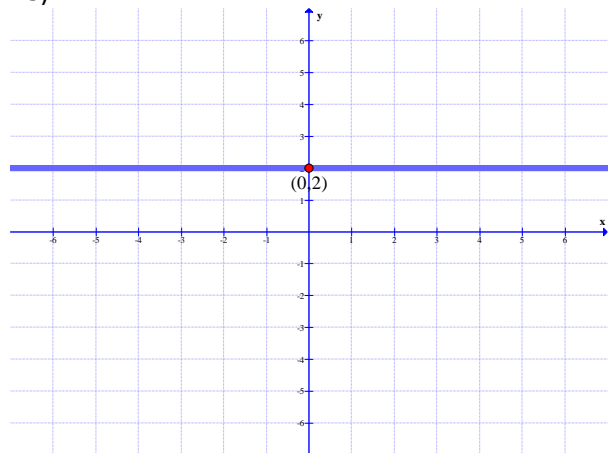
16)



17)



18)



# Chapter 3: Introduction to Functions and Relations

## Section 3.3: Introduction to Functions

#1 - 6: Which of the relations define  $y$  as a function of  $x$ ?

1)  $\{ (1,2) (3,2) (4,2) (5,2) \}$

2)  $\{ (6,1) (7,1) (8,1) \}$

3)  $\{ (1,2) (3,4) (5,6) (7,8) (9,10) \}$

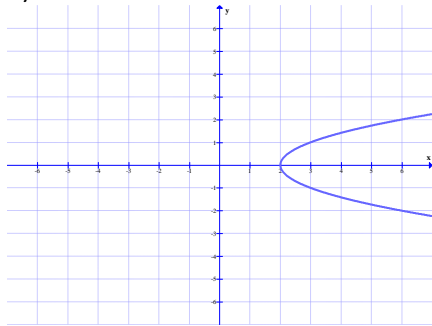
4)  $\{ (1,2) (4,5) \}$

5)  $\{ (3,1) (4,5) (3,6) \}$

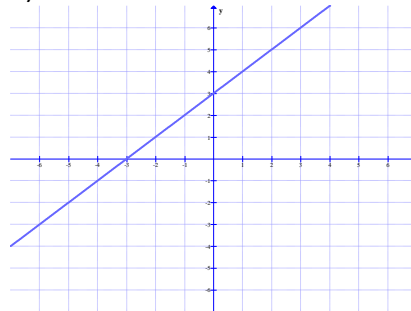
6)  $\{ (3,7) (1,5) (1,2) \}$

#7 - 12: Use the vertical line test to determine whether the relation defines  $y$  as a function of  $x$ .

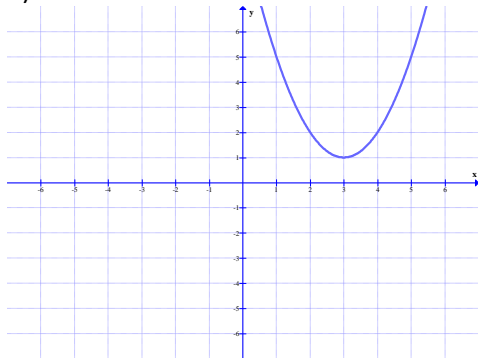
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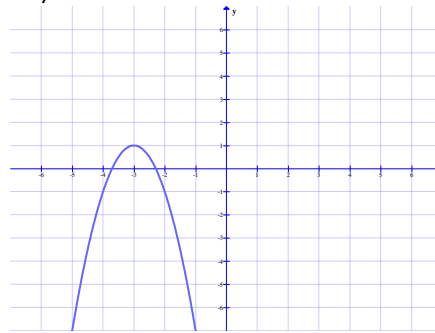
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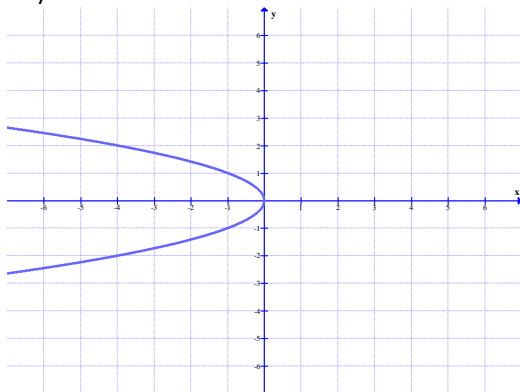
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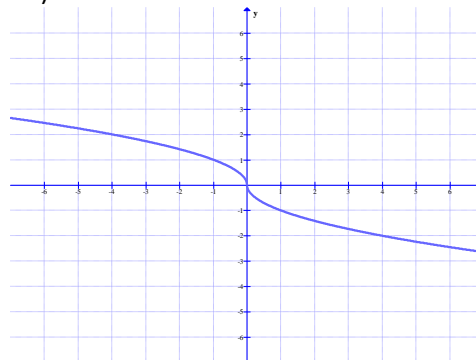
10)



11)



12)



## Chapter 3: Introduction to Functions and Relations

### Section 3.3: Introduction to Functions

#13 - 30: Consider the functions defined by and find the requested function values.

$$k(x) = 5x^2$$

$$f(x) = 3x + 4$$

$$g(x) = x^2 + 5x + 6$$

$$h(x) = 4$$

13)  $f(3)$

14)  $f(-2)$

15)  $g(1)$

16)  $g(0)$

17)  $h(2)$

18)  $h(3)$

19)  $k(-5)$

20)  $k(-6)$

21)  $f(b)$

22)  $f(c)$

23)  $f(b+1)$

24)  $f(b-2)$

25)  $g(2a)$

26)  $g(3a)$

27)  $g(x-2)$

28)  $g(x+1)$

29)  $k(a)$

30)  $k(a-2)$

#31 - 42: Refer to functions  $y = f(x)$  and  $y = g(x)$  defined as follows:

$$f = \{ (1,2) (2,3) (3,5) (9,3) \}$$

$$g = \{ (1,-2) (5,6) (-1,17) (4,-2) (6,4) \}$$

31) Identify the domain of  $f$ .

32) Identify the domain of  $g$

33) Identify the range of  $f$

34) Identify the range of  $g$

35) For what value(s) of  $x$  is  $f(x) = 3$ ?

36) For what value(s) of  $x$  is  $f(x) = 2$ ?

37) For what value(s) of  $x$  is  $g(x) = -2$

38) For what value(s) of  $x$  is  $g(x) = 4$

39) Find  $f(3)$

40) Find  $f(2)$

41) Find  $g(6)$

42) Find  $g(-1)$

## Chapter 3: Introduction to Functions and Relations

### Section 3.3: Introduction to Functions

#43 - 53: Find the domain and write your answer in interval notation.

43)  $f(x) = \frac{2}{x-3}$

44)  $g(x) = \frac{4}{x-5}$

45)  $h(t) = \frac{3}{4t}$

46)  $g(p) = \frac{6}{p}$

47)  $m(x) = \frac{x+2}{x-3}$

48)  $n(x) = \frac{x-1}{x+3}$

49)  $f(x) = x + 2$

50)  $m(x) = 2x + 4$

51)  $g(x) = x^2 - 9$

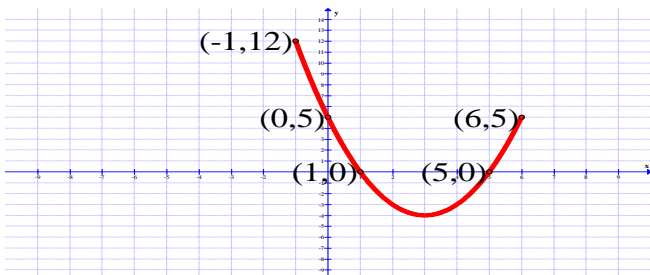
52)  $f(x) = x^2 - 16$

53)  $h(x) = x^2 - 5x + 6$

54)  $f(x) = x$

#55 - 57: Find the requested function values.

55) We will refer to the function in the graph as  $f$ .

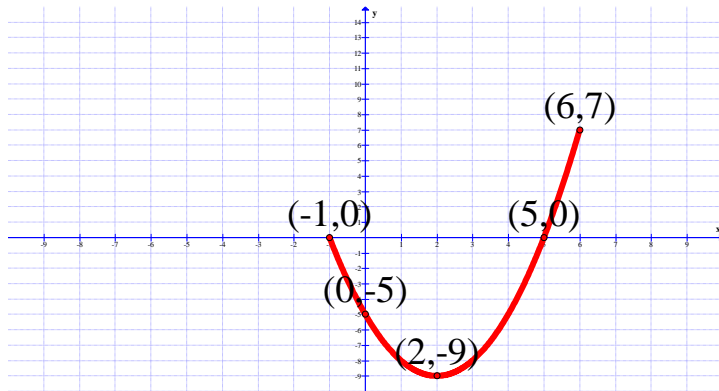


- find the x-intercepts
- find the y-intercept
- for what values of  $x$  is  $f(x) = 5$
- find  $f(5)$



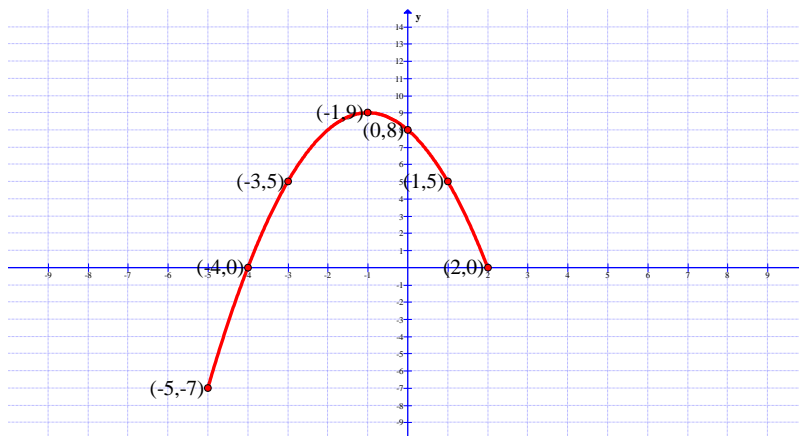
## Chapter 3: Introduction to Functions and Relations

56) We will refer to the function in the graph as  $g$ .



- find the x-intercepts
- find the y-intercept
- for what values of  $x$  is  $g(x) = 7$
- find  $g(0)$

57) We will refer to the function in the graph as  $h$ .



- find the x-intercepts
- find the y-intercept
- for what values of  $x$  is  $h(x) = 0$
- find  $h(0)$

## Chapter 3: Introduction to Functions and Relations

### Section 3.4: Graphs of Basic Functions

#1 - 4: Sketch a graph by completing the table and plotting the points.

1)  $f(x) = |x|$

x	f(x)
-2	
-1	
0	
1	
2	

2)  $g(x) = x^2$

x	g(x)
-2	
-1	
0	
1	
2	

3)  $h(x) = \sqrt{x}$

x	h(x)
0	
1	
4	
9	
16	

4)  $k(x) = x^3$

x	k(x)
-2	
-1	
0	
1	
2	

## Chapter 3: Introduction to Functions and Relations

### Section 3.4: Graphs of Basic Functions

#5 - 16: Find the x- and y-intercepts.

5)  $f(x) = 2x - 6$

6)  $g(x) = 3x - 12$

7)  $h(x) = -3x$

8)  $k(x) = 2x$

9)  $A(x) = (x+1)(3x-2)$

10)  $B(x) = (2x-5)(3x-12)$

11)  $f(x) = x^2 + 5x - 6$

12)  $g(x) = x^2 + 4x + 3$

13)  $h(x) = 2x(x-3)(x-4)$

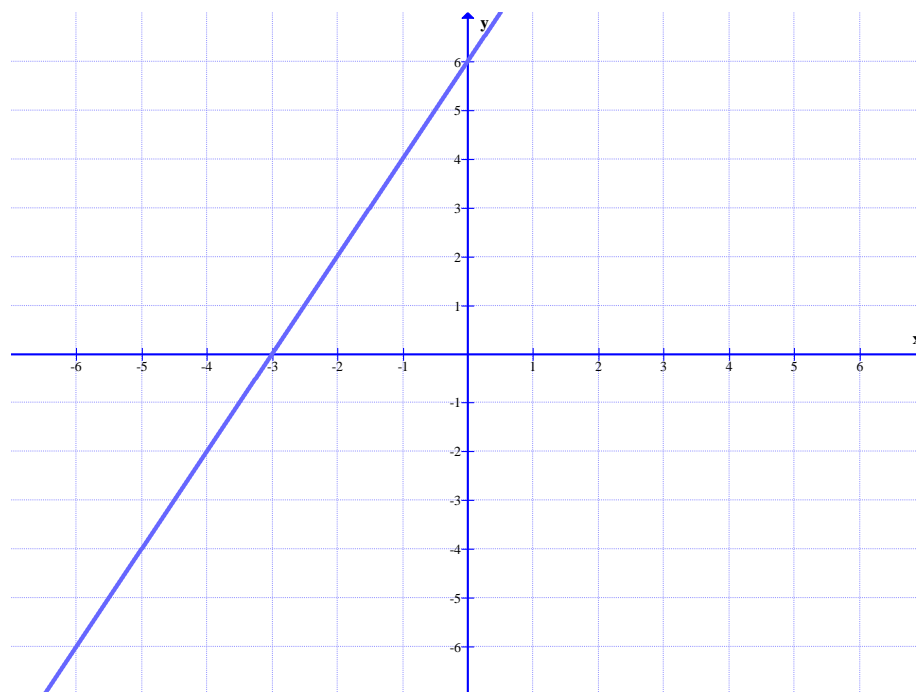
14)  $k(x) = x(x+1)(x-2)$

15)  $f(x) = x^3 + 4x^2 - 5x$

16)  $g(x) = x^3 - 3x^2 + 2x$

#17 - 19: Use the graph of the function to determine the x- and y-intercepts.

17)  $f(x) = 2x + 6$

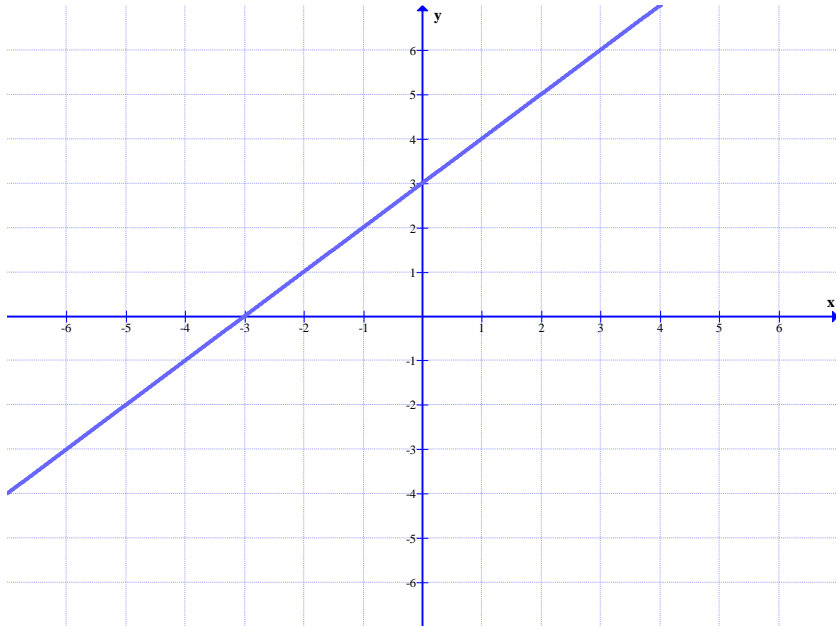


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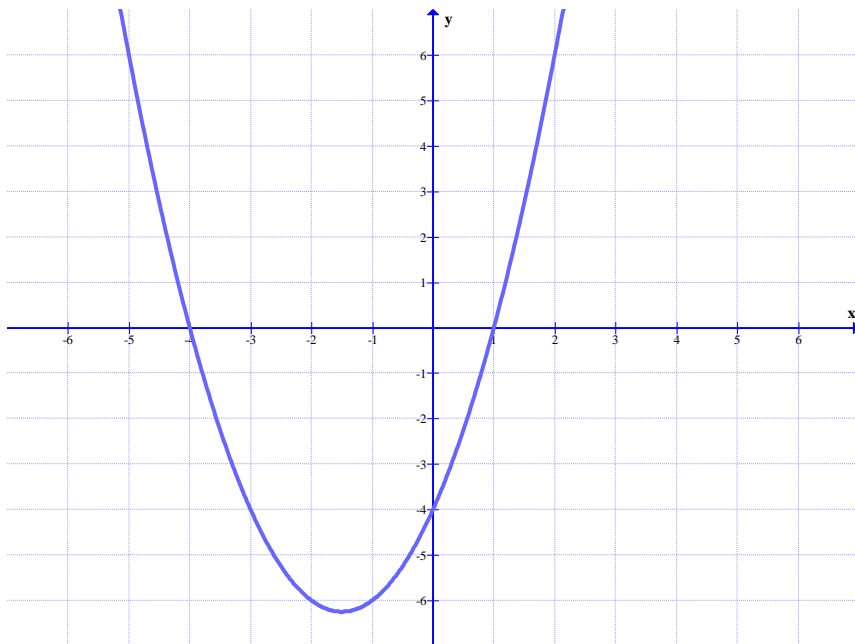
### Section 3.4: Graphs of Basic Functions

#17 - 19 Continued: Use the graph of the function to determine the x- and y-intercepts.

18)  $f(x) = x + 3$



19)  $f(x) = x^2 + 3x - 4$



## Chapter 3: Introduction to Functions and Relations

### Section 3.5: Variation

#### Important words in section 3.5

**Varies directly and is directly proportional** – translate to: *is some number times*

*The words y varies directly as x has the same meaning as y is some number times x*

*The words y is directly proportional to x has the same meaning as y is some number times x*

**Varies inversely and is inversely proportional** – translate to: *is some number divided by (form a fraction with k in the numerator)*

*The words y varies inversely as x has the same meaning as y is some number divided by x*

*The words y is inversely proportional to x has the same meaning as y is some number divided by x*

**Varies jointly** – translate to: *is some number times two variables*

*The words y varies jointly as x and z has the same meaning as y is some number times the product of x and z.*

**Square of x** symbol to use  $x^2$  for example the square of 9 would be written as  $9^2 = 81$

**Square root of x** symbol to use  $\sqrt{x}$  for example the square root of 9 would be written as  $\sqrt{9} = 3$

**cube of x** symbol to use  $x^3$  for example the cube of 8 would be written as  $8^3 = 512$

**Cube root of x** symbol to use  $\sqrt[3]{x}$  for example the cube root of 8 would be written  $\sqrt[3]{8} = 2$

#1 - 8: Write a variation model. Use k as the constant of variation.

- 1) W varies directly as the square of x
- 2) A varies directly as the square root of b
- 3) Y varies inversely as the cube of x
- 4) Z varies inversely as the square of y.
- 5) Q is inversely proportional to the square root of x
- 6) W is inversely proportional to the cubed root of x.
- 7) M varies jointly as the square of x and the cube of y.
- 8) B varies jointly as x and the square root of y.

## Chapter 3: Introduction to Functions and Relations

### Section 3.5: Variation

#9 - 14: Find the constant of variation,  $k$ .

9)  $y$  varies directly as the square of  $x$  and  $y$  is 45 when  $x$  is 3.

10)  $M$  varies directly as the square root of  $y$  and  $M$  is 12 when  $y$  is 16.

11)  $T$  varies inversely as  $Q$  and when  $Q$  is 5,  $T$  is 10.

12)  $Z$  varies inversely as  $X$  and when  $X$  is 20,  $Z$  is 4.

13)  $N$  varies jointly as  $x$  and  $y$ . When  $x$  is 2 and  $y$  is 3,  $N$  is 42.

14)  $N$  varies jointly as  $y$  and the square of  $x$ . When  $x$  is 3 and  $y$  is 2,  $N$  is 54.

#15 - 20: Solve.

15)  $Y$  varies directly as the cube of  $x$ .  $Y$  is 24 when  $x = 2$ . Find  $Y$  when  $x = 5$ .

16)  $Z$  varies directly as the square of  $x$ .  $Z$  is 54 when  $x$  is 3. Find  $Z$  when  $x = -2$ .

17)  $W$  varies inversely as  $q$ .  $W$  is 10 when  $q$  is 5. Find  $W$  when  $q$  is 3.

18)  $M$  varies inversely as the square root of  $n$ .  $M$  is 15 when  $n$  is 9. Find  $M$  when  $n$  is 16.

19)  $Y$  varies jointly as  $x$  and the square of  $z$ .  $Y$  is 48 when  $z$  is 2 and  $x$  is 3. Find  $Y$  when  $x$  is 3 and  $z$  is 4.

20)  $B$  varies jointly as  $a$  and the square root of  $c$ .  $B$  is 60 when  $a$  is 5 and  $c$  is 9. Find  $B$  when  $a$  is 4 and  $c$  is 16.

21) The number of days ( $d$ ) required to build a bridge varies inversely to the number of workers ( $w$ ). A bridge can be built in 12 days with 20 workers. How long will it take to build with 30 workers?

22) The number of days ( $d$ ) to paint a building varies inversely to the number of workers ( $w$ ). A building can be painted in 2 days with 5 workers. How long will it take to paint the building with 8 workers?

23) The distance ( $d$ ) a ball rolls down an inclined plane is directly proportional to the square of the time ( $t$ ) it rolls. During the first second, the ball rolls 8 feet. How far will the ball roll during the first 3 seconds?

## Chapter 3: Introduction to Functions and Relations

### Section 3.5: Variation

24) The stopping distance ( $d$ ) of a car varies directly as the square of the speed ( $s$ ) of the car. If a car traveling at 40 mph has a stopping distance of 200 feet, find the stopping distance of a car that is traveling 15 miles per hour. (round to 1 decimal place if needed)

25) The stopping distance ( $d$ ) of a car varies directly as the square of the speed ( $s$ ) of the car. If a car traveling at 10 mph has a stopping distance of 50 feet, find the stopping distance of a car that is traveling 40 miles per hour. (round to 1 decimal place if needed)

26) In Pennsylvania, the state income ( $T$ ) tax varies directly to gross income ( $I$ ). The state tax is \$42 for a gross monthly income of \$1500. What is the amount of state income tax for a gross monthly income of \$2000?

27) The simple interest ( $I$ ) on an investment varies directly to the amount of the investment ( $A$ ). An investment of \$2500 yields interest of \$125. How much interest will a \$4000 investment yield?

# Chapter 3: Introduction to Functions and Relations

## Chapter 3: Review

1) Find the x- and y-intercepts (if any). Then sketch a graph.

a)  $2x - 3y = 18$

b)  $3x - 5y = 0$

2) Write the slope-intercept form of the line, then identify the slope and y-intercept.

$$\frac{1}{3}x - \frac{2}{3}y = 4$$

3) Find the equation of a line in slope intercept form with given properties.

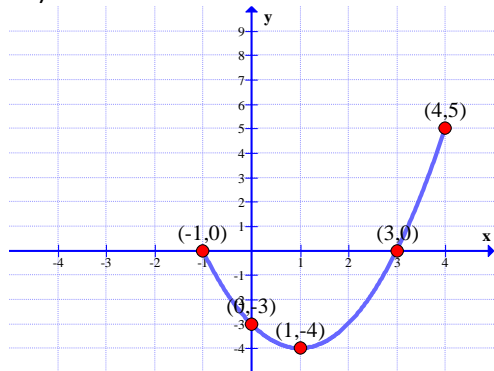
a) The slope is  $\frac{2}{5}$  and the line passes through  $(-1, 2)$

b) The slope is 0 and the line passes through  $(\frac{1}{4}, -\frac{3}{5})$

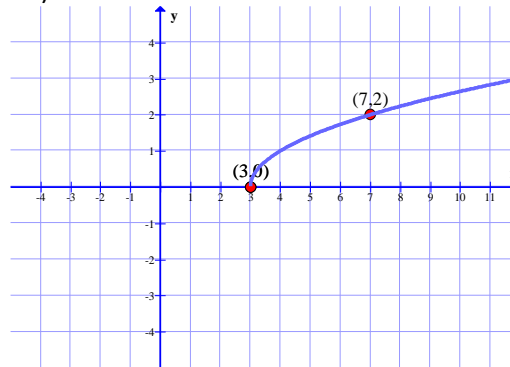
c) The line passes through the points  $(4, -1)$  and  $(6, -7)$

4. Find the domain and range, use interval notation when appropriate.

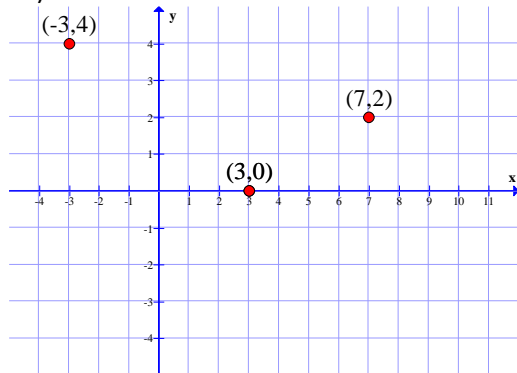
4a)



4b)



4c)





## Chapter 3: Introduction to Functions and Relations

### Chapter 3: Review

5. Refer to problem 4a, on the previous page of the review.

(we will call the function  $f$ )

a) Find  $f(-1)$

b) for what values of  $x$  is  $f(x) = 5$

c) find the  $x$  and  $y$  intercepts

6. Consider the functions defined by  $f(x) = 3x + 4$   $g(x) = x^2 - 3$   $h(x) = |x + 1|$  Find the function values.

a)  $f(-3)$

b)  $h(4)$

c)  $g(-2)$

d)  $g(x+2)$

7. Refer to the function  $y = f(x)$  as defined:  $f = \{ (1,-1) (4,-2) (-6,-2) (-2,1) \}$

a) Find the domain of  $f$

b) Find the range of  $f$

c) For what value(s) of  $x$  is  $f(x)=1$

d) Find  $f(4)$

8. Find the domain, write your answer in interval notation.

a)  $g(x) = \frac{x+2}{x-3}$       b)  $h(p) = \frac{p+4}{p^2+2p-3}$

9. Find the domain, write your answer in interval notation.

a)  $f(x) = x^2$

b)  $g(x) = x - 3$

## Chapter 3: Introduction to Functions and Relations

### Chapter 3: Review

10. Find the x- and y- intercepts

a)  $f(x) = 3x^2 + 4x - 4$

b)  $h(x) = 3x(2x-6)(x+1)$

11. Fill in the table and sketch a graph of  $f(x) = x^2 - 3$

x	f(x)
-2	
-1	
0	
1	
2	

12. Write a variation model. Use k as the constant of variation:

a) P varies directly as the square of x

b) T varies jointly as x and the square of w

13. Find the constant of variation.

a) y varies directly as x and when x is 2 y is -12

b) p varies inversely as q and q = 8 when p is 3

14) The costs (c) of a trucking company vary jointly as the number of trucks (t) in service and the number of hours (h) they are used. When 4 trucks are used for 6 hours each, the costs are \$1,800. Find the costs of using 10 trucks, each for 12 hours.

15. The simple interest (I) on an investment varies directly to the amount of the investment (A). An investment of \$1000 yields interest of \$75. How much interest will a \$5,000 investment yield?