Unit 3A.1 – Graphing Linear Equations

Student Learning Targets:

- I can use key features of a liner algebraic function to graph the function.
- I can, given a function in a table or in algebraic form, identify key features such as x-and y-intercepts; intervals where the function is increasing, decreasing, positive, or negative; and end behavior.
- I can identify a domain in a particular context.

Notes:

Notes (Continued for 3A.1):

Assignment 3A.1

Graph the following functions. State the Domain and Range.

1. x-intercept $= 5$, y-intercept $= -2$

2. x-intercept $= -4$, y-intercept $= 5$

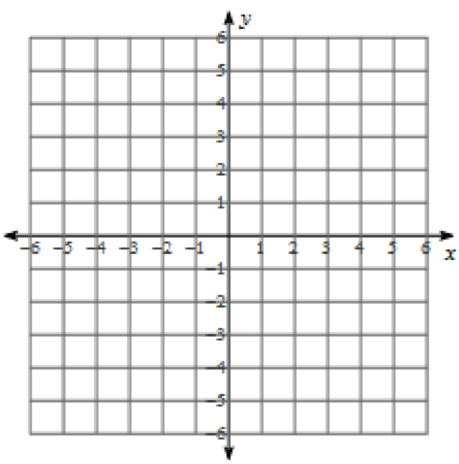
3. Slope $= -\frac{2}{3}$, y-intercept $= 1$

4. Slope $= \frac{1}{4}$, y-intercept $= 3$

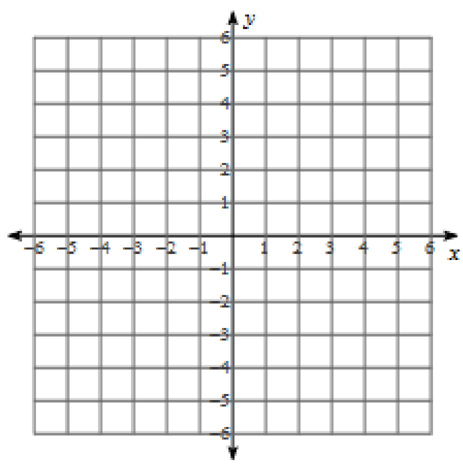
5. Slope $= \frac{5}{4}$, y-intercept $= -1$

6. Slope $= -\frac{5}{2}$, y-intercept $= -5$

1-2



3-4



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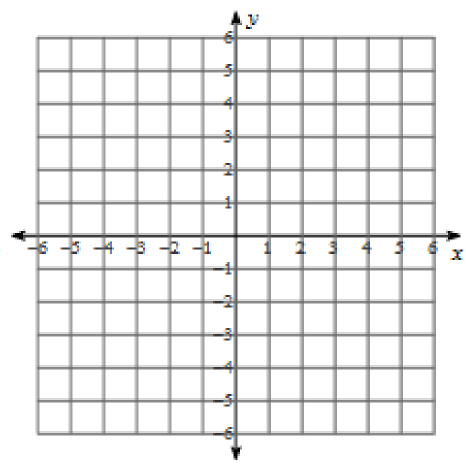
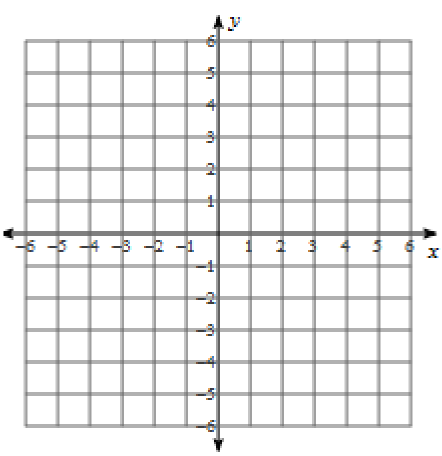
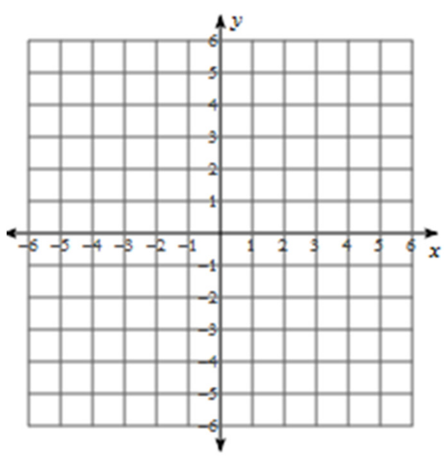


Graph the following using a T-Chart. Identify: where it is increasing/decreasing and what its end behavior is.

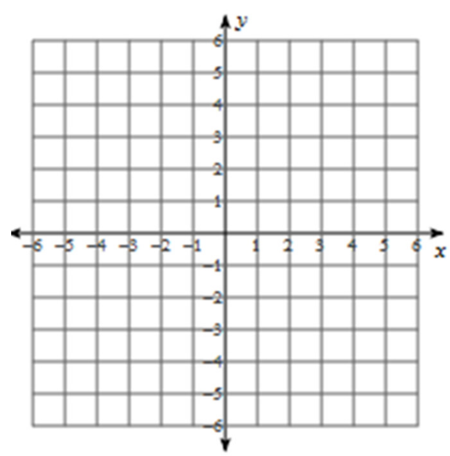
7. $y = -2x - 1$



8. $y = 6x - 3$



9. $y + 3 = 3(x + 1)$



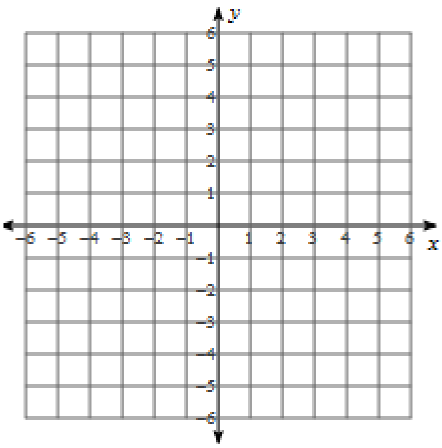
Assignment 3A.1 (Continued)

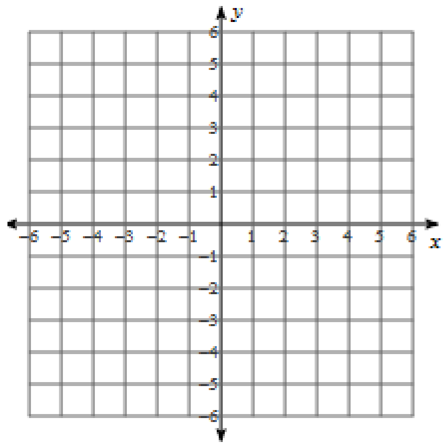
Graph the following when given in Slope Intercept Form. Sate the Domain and Range, and identify the x and y intercepts.

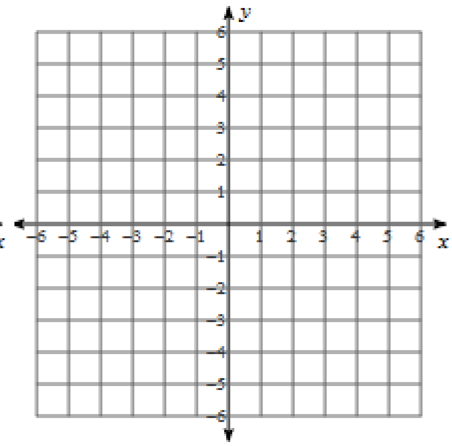
10. $y = -\frac{3}{5}x + 2$

11. $y = \frac{5}{4}x$

12. $x = 2$





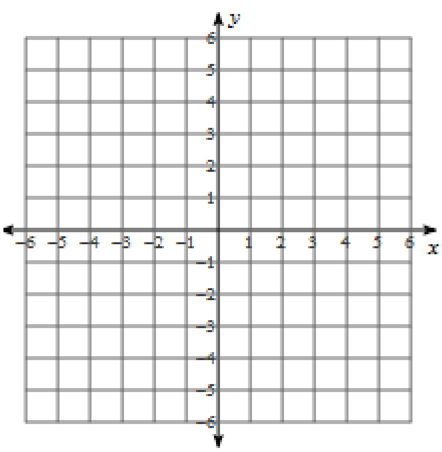


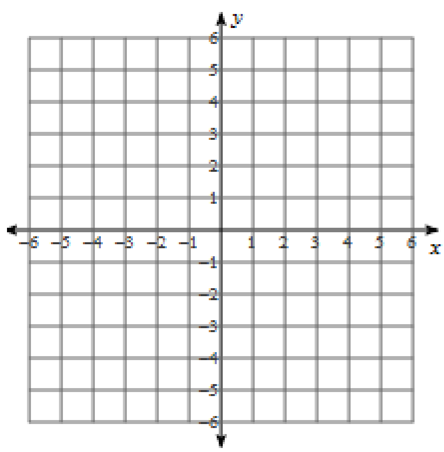
Rewrite each equation in Slope Intercept Form, then graph giving the x and y intercepts and state the domain and range.

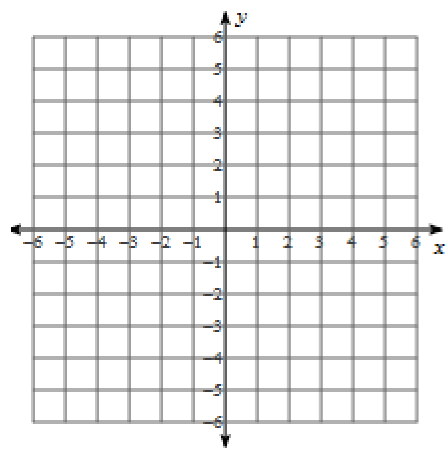
13. $10x - 3y = -9$

14. $-1 + \frac{1}{2}y = -\frac{1}{5}x$

15. $-4y - 16 = -9x$



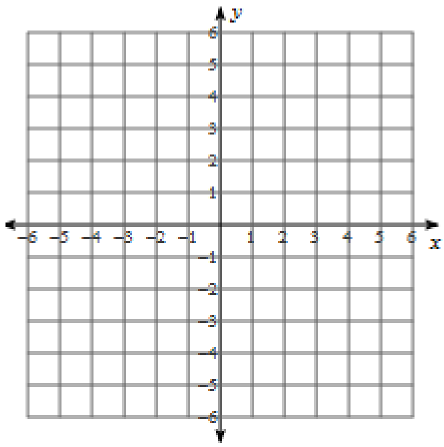




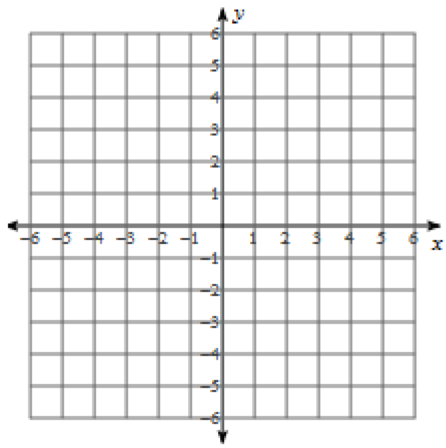
Assignment 3A.1 (Continued)

Graph using any method.

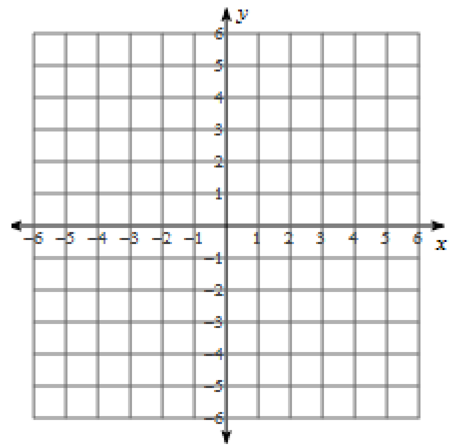
16. $y-4=-\frac{3}{4}(x+4)$



17. $y-5=\frac{7}{5}(x-5)$



18. $y+4=4(x+2)$



Unit 3A.2 – Writing Linear Equations

Student Learning Targets:

- I can, given a linear context, find an explicit algebraic expression or series of steps to model the context with mathematical representations.

Notes:

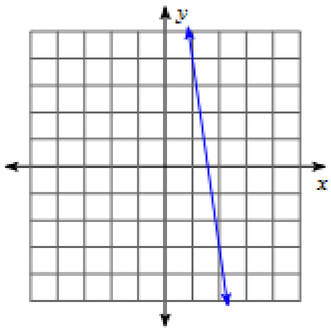
Notes (Continued for 3A.2):

Assignment 3A.2

Find the slope of the line passing through the given points.

1. $(-7, 15), (-6, 9)$ 2. $(-19, -6), (-16, -9)$ 3. $(10, 7), (12, 2)$

Find the slope of the line in the given graphs:

4.


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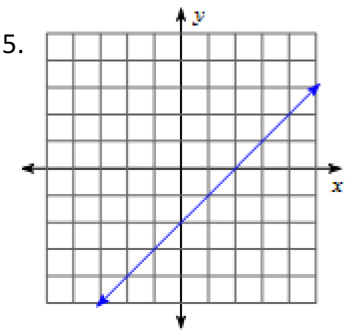
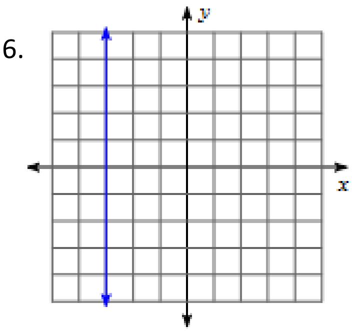


6.


Find the equation of the line and give your answer in slope intercept from.

7. through: $(-2, -5)$, slope $= \frac{1}{2}$ 8. through: $(-3, 3)$, slope $= -2$ 9. through: $(-3, 3)$, slope $= -\frac{2}{3}$

10. through: $(-3, -3)$, slope = undefined

Find the equation of the line passing through the given points. Give your answer in Standard form.

11. through: $(0, 5)$ and $(3, 4)$ 12. through: $(4, -1)$ and $(0, 1)$ 13. through: $(0, 2)$ and $(1, -5)$

Assignment 3A.2 (Continued)

Write the slope intercept form of the equation of the line described.

14. through: $(4, 4)$, parallel to $y = \frac{9}{4}x - 3$

15. through: $(-3, -5)$, parallel to $y = 3x + 1$

Write the standard form of the equation of the line described.

16. through: $(4, 0)$, perp. to $y = -2x - 4$

17. through: $(-5, 3)$, perp. to $y = x - 4$

Write the equation of the lines given in the indicated graphs. Give your equation in standard form.

18. #4 above

19. #5 above

20. #6 above

Given the following tables, generate a linear equation in standard form that represents it.

21.

x	y
2	4
3	6
4	8
10	20

22.

x	y
0	-7
3	-8
6	-9
9	-10

23.

x	y
0	5
4	8
8	11
12	14

Unit 3A.3 – Graphing Absolute Value

Student Learning Targets:

- I can perform transformations on absolute functions with and without technology.
- I can describe the effect of each transformation on functions (e.g., If f(x) is replaced with f(x+k)).
- I can, given the graph of a function, describe all transformations using specific values of k.
- I can identify a domain in a particular context.
- I can recognize which transformations take away the even nature of absolute value function.

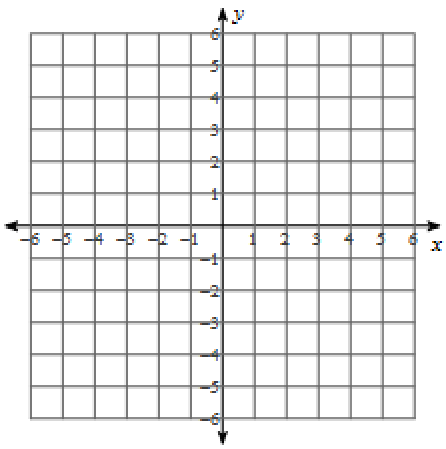
Notes:

Notes (Continued for 3A.3):

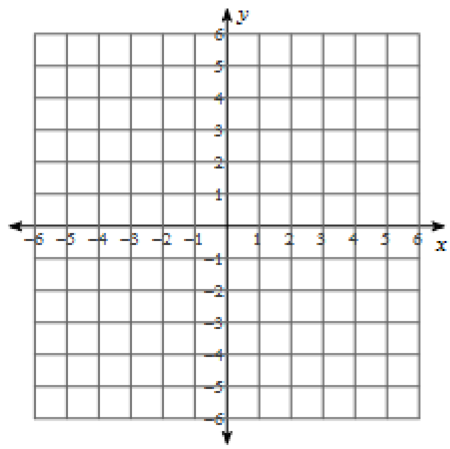
Assignment 3A.3

Graph the following absolute value function. Hint (T-Chart always works, or use vertical and horizontal shift)

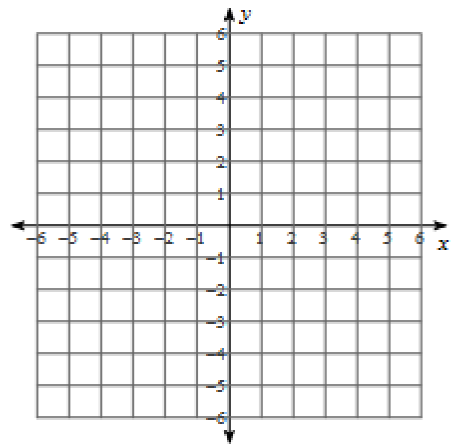
1. $y = |x| + 3$



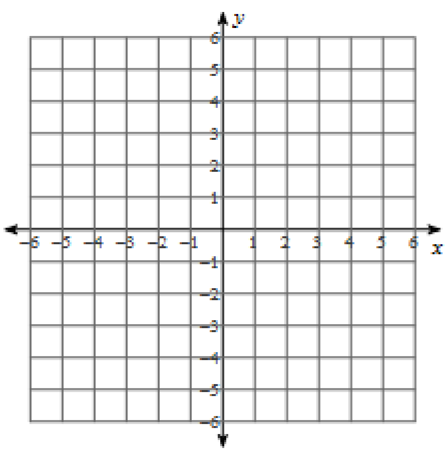
2. $y = |x + 4|$



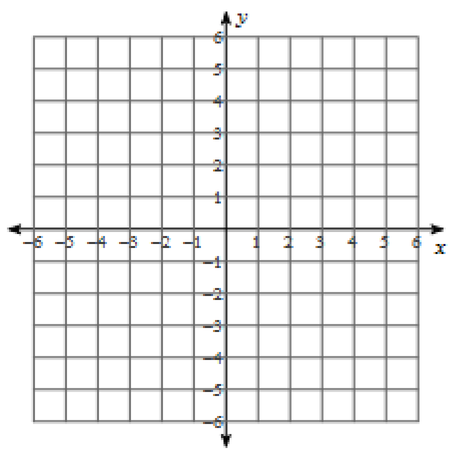
3. $y = |x - 1| + 2$



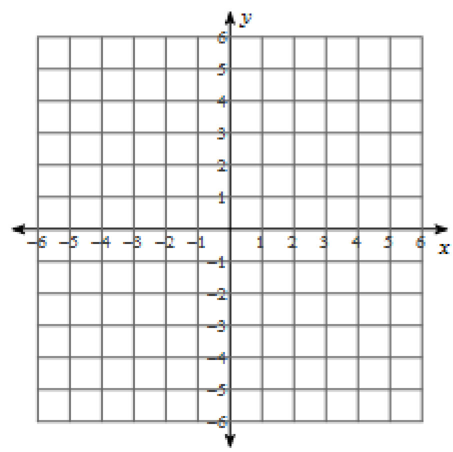
4. $y = 2|2x| + 2$



5. $y = -3|2x - 2|$



6. $y = 2|2x + 4| - 1$



Explain in words the following transformations. Given: $f(x) = |x|$

7. Describe what happens when you have $f(x) = |x + 7| + 5$

8. Describe what happens when you have $f(x) = |x - 4| - 2$

9. Describe what happens when you have $f(x) = |x - 3| + 3$

Assignment 3A.3 (Continued)

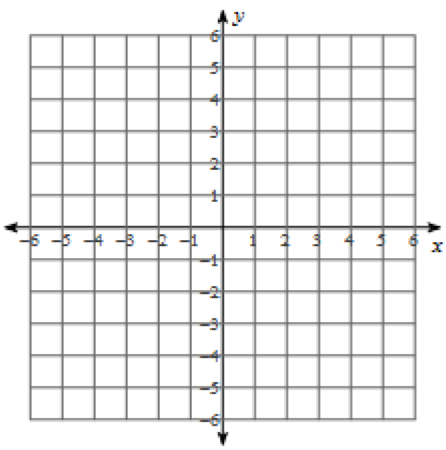
10. Describe what happens when you have $f(x) = |x + 2| - 1$

11. Describe what happens when you have $f(x) = \frac{1}{2}|x - 4| - 5$

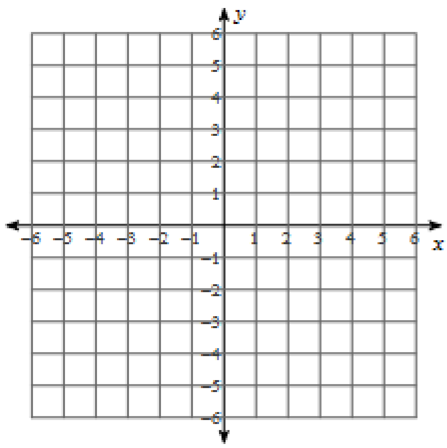
12. Describe what happens when you have $f(x) = \frac{-2}{3}|x + 2| + 3$

Graph the following functions on your calculator indicating the domain and range of each.

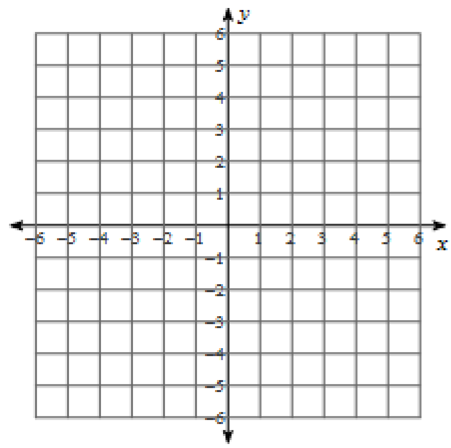
13. $y = |x - 1| + 2$



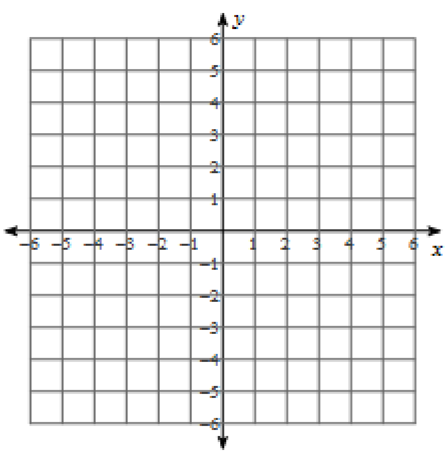
14. $y = |x + 2| + 4$



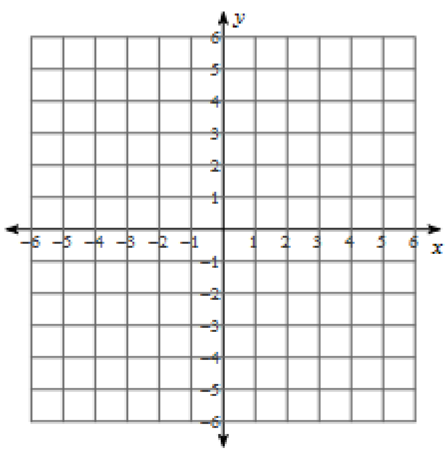
15. $y = 2|3x + 3| + 1$



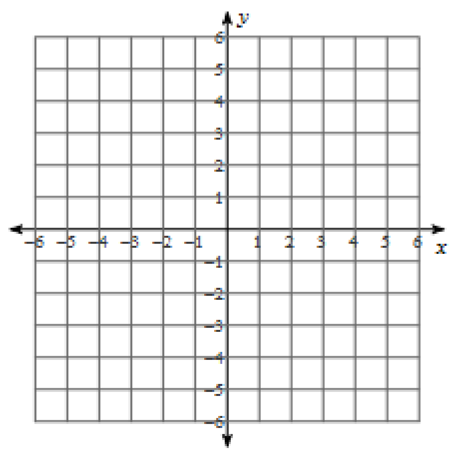
16. $y = -3|2x - 2|$



17. $y = 2|-3x| + 1$



18. $y = 3|3x - 3| - 1$



Assignment 3A.3 (Continued)

Explain whether each function in problems 13-18 is even, odd or neither.

19. #13

20. #14

21. #15

22. #16

23. #17

24. #18

Unit 3A.4 – Graphing Piecewise Functions

- I can graph and find key features of piecewise-defined functions, including step functions and absolute value functions.

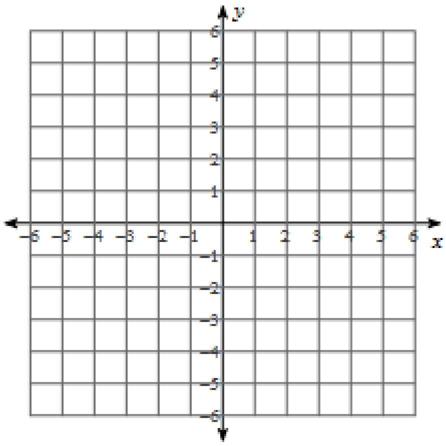
Notes:

Notes (Continued for 3A.4):

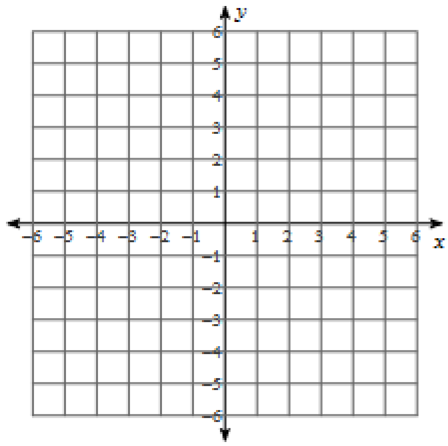
Assignment 3A.4

Graph the following step functions, and identify the domain and range.

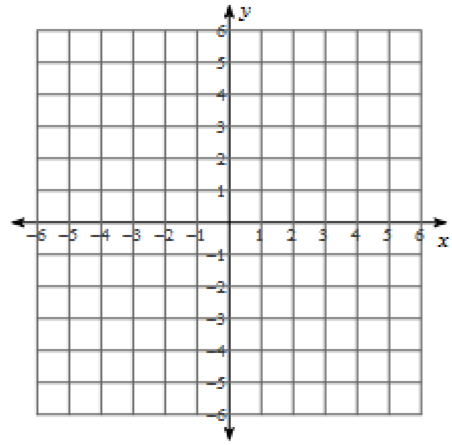
1. $f(x) = \frac{1}{2}[\![x]\!]$



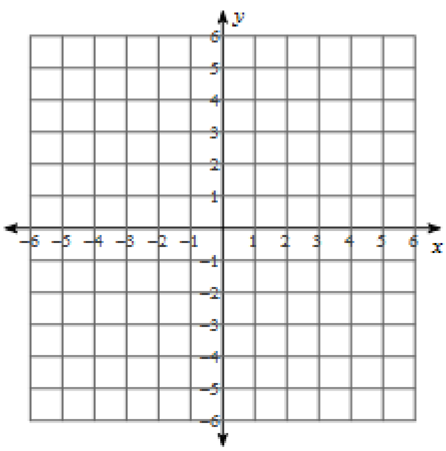
2. $g(x) = -[\![x]\!]$



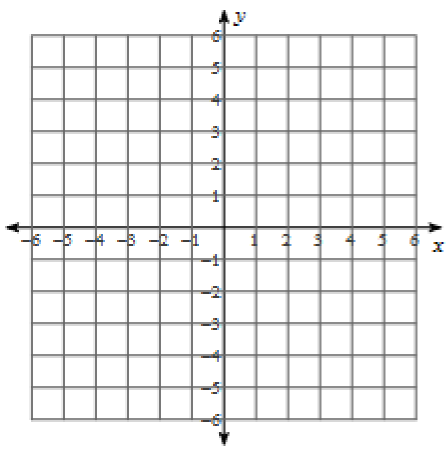
3. $h(x) = [\![2x]\!]$



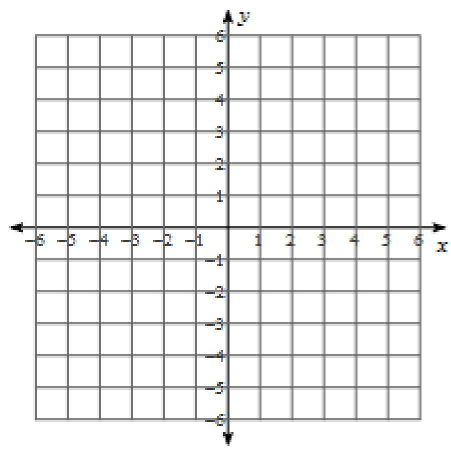
4. $g(x) = [\![x]\!] + 3$



5. $h(x) = [\![x]\!] - 1$

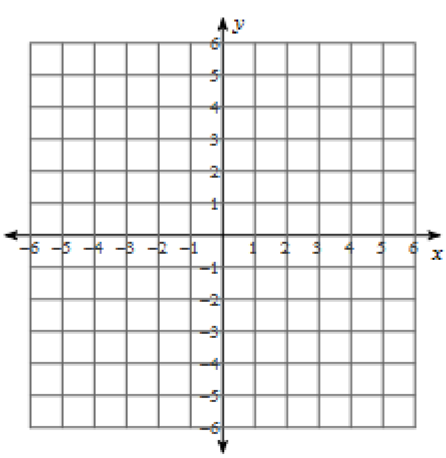


6. $h(x) = \frac{1}{2}[\![x]\!] + 1$

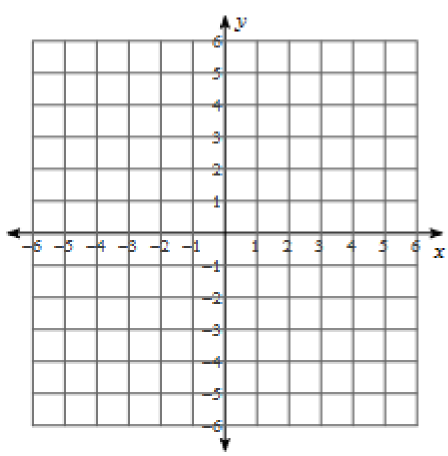


Graph the following piece-wise functions, and identify the domain and range

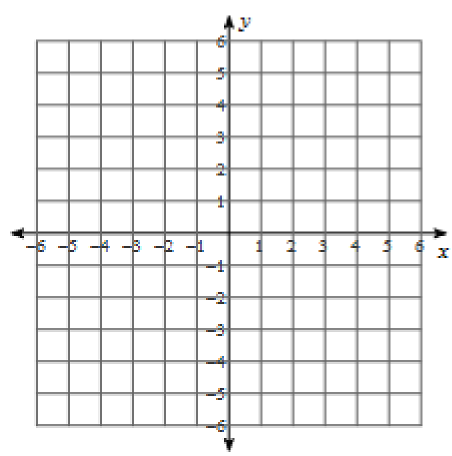
7. $f(x) = \begin{cases} \frac{1}{2}x - 1 \text{ if } x > 3 \\ -2x + 3 \text{ if } x \leq 3 \end{cases}$



8. $f(x) = \begin{cases} 3x + 4 \text{ if } x \geq 1 \\ x + 3 \text{ if } x < 1 \end{cases}$



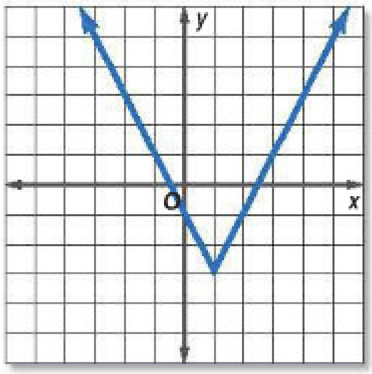
9. $f(x) = \begin{cases} 3x + 2 \text{ if } x > -1 \\ -\frac{1}{2}x - 3 \text{ if } x \leq -1 \end{cases}$



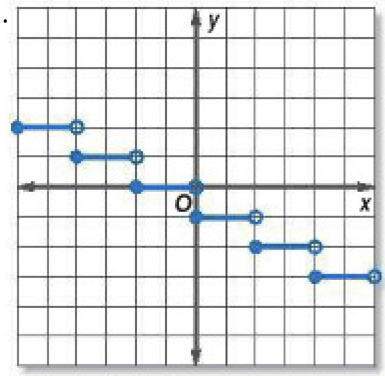
Assignment 3A.4 (Continued)

Determine the domain and range for the following graphs:

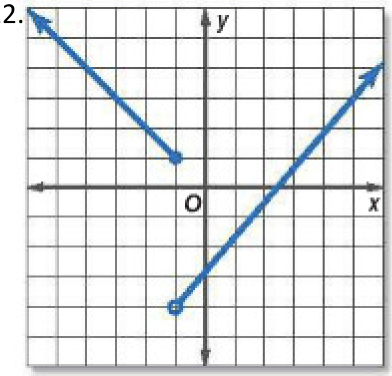
10.



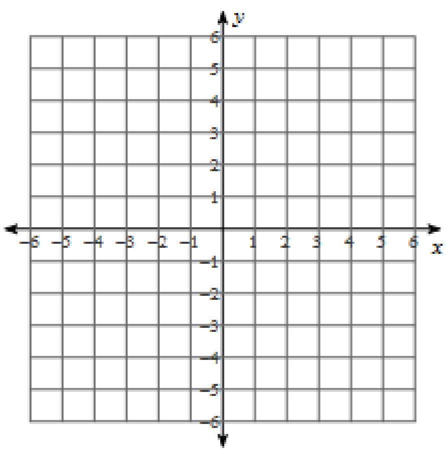
11.



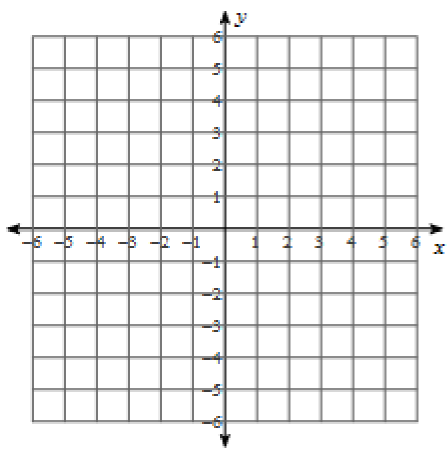
12.



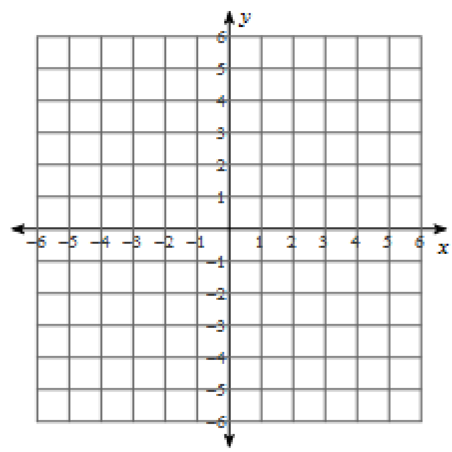
13. $h(x) = -2|x-3|+2$



14. $g(x) = -\frac{2}{3}|x+6|-1$



15. $h(x) = -\frac{3}{4}|x-8|+1$

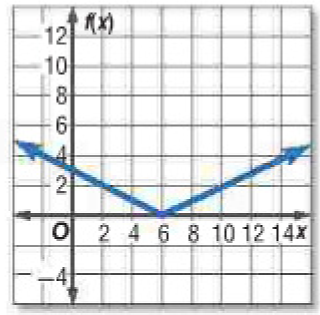


16. Dance: A local studio owner will teach up to 4 students by herself. Her instructors can teach up to 5 students each. Draw a step function graph that best describes the number of instructors needed for the different numbers of students.

17. Theatres: A community theater will only perform a show if there are at least 250 presale ticket requests. Additional performances will be added for each 250 requests after that. Draw a step function that best describes the situation.

Assignment 3A.4 (Continued)

18. Write an absolute value function that represents the graph.



19. **BOATING** According to Boat Minnesota, the maximum number of people that can safely ride in a boat is determined by the boat's length and width. The table shows some guidelines for the length of a boat that is 6 feet wide. Graph this relation.

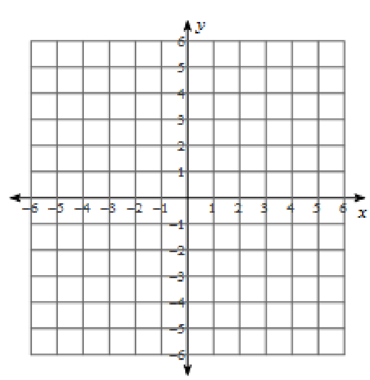
Length of Boat (ft)	18–19	20–22	23–24
Number of People	7	8	9

20. **BASEBALL** A baseball team is ordering T-shirts with the team logo on the front and the players' names on the back. A graphic design store charges $10 to set up the artwork plus $10 per shirt, $4 each for the team logo, and $2 to print the last name for an order of 10 shirts or less. For orders of 11–20 shirts, a 5% discount is given. For orders of more than 20 shirts, a 10% discount is given.

a. Organize the information into a table. Include a column showing the total order price for each size order.

b. Write an equation representing the total price for an order of shirts.

c. Graph the piecewise function.



Unit 3B.1 – Factoring Quadratics and Completing the Square

Student Learning Targets:

- I can factor quadratics and complete the square to find intercepts, extreme values, and symmetry of the graph.

Notes:

Notes (Continued for 3B.1):

Assignment 3B.1

Factor the equation. State the x and y intercepts.

1. $y = 2x^2 + 8x + 6$

2. $y = x^2 - 11x + 30$

3. $y = 3x^2 - 3x - 18$

4. $y = 5x^2 - 6x + 1$

5. $y = 15x^2 - 14x - 8$

6. $y = 3x^2 - 8x$

Find the vertex (extreme value) by using the midpoint of the x intercepts. (These are the same problems as #1-6)

7. $y = 2x^2 + 8x + 6$

8. $y = x^2 - 11x + 30$

9. $y = 3x^2 - 3x - 18$

10. $y = 5x^2 - 6x + 1$

11. $y = 15x^2 - 14x - 8$

12. $y = 3x^2 - 8x$

Assignment 3B.1 (Continued)

Find the vertex (extreme value) by using the formula (-b/2a).

13. $y = -x^2 + 8x - 14$

14. $y = -x^2 - 6x - 13$

15. $y = -2x^2 - 8x - 12$

Complete the square. Put the equation in vertex form and state the extreme values (vertex).

16. $y = x^2 - 6x - 7$

17. $y = x^2 - 12x - 5$

18. $y = x^2 - 8x + 18$

State what kind of symmetry the graph shows. If no symmetry is shown, write none.

19. $y = x^2 - 9$

20. $y = x^2 - 13x - 5$

21. $y = -x^2 + 16$

Unit 3B.2 – Graphing Quadratics in Various Forms and Rate of Change

Student Learning Targets:

- I can graph quadratic functions expressed in various forms by hand.
- I can transition between forms of quadratic functions and identify the advantages of each.
- I can calculate the rate of change in a quadratic function over a given interval from a table or equation.

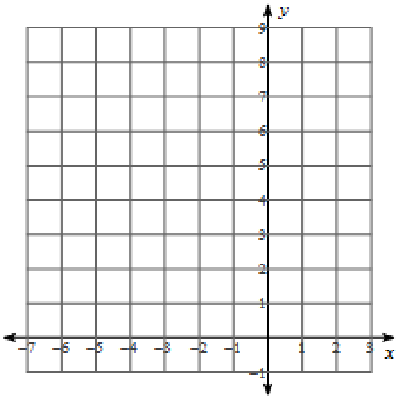
Notes:

Notes (Continued for 3B.2):

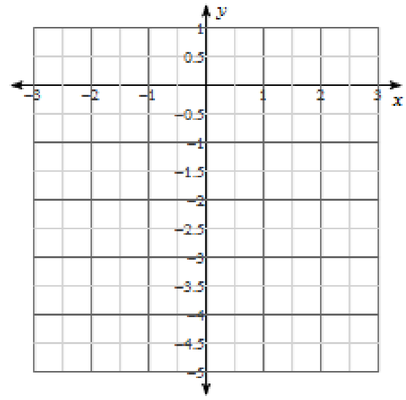
Assignment 3B.2

Graph the given function and label the vertex.

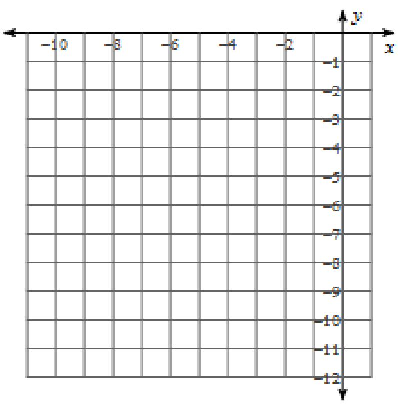
1) $y = 2x^2$



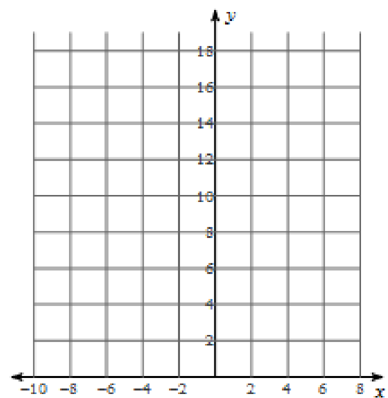
2) $y = -x^2$



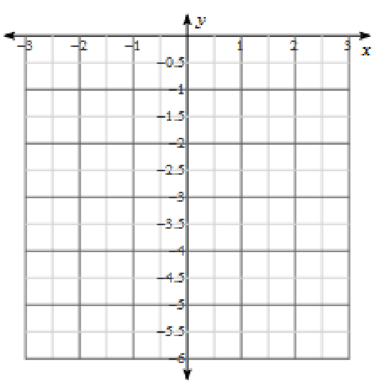
3) $y = -2(x+1)^2 - 3$



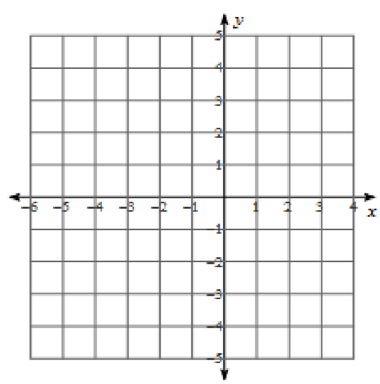
4) $y = 4(x+3)^2 + 2$



5) $y = -(x+1)^2 - 1$

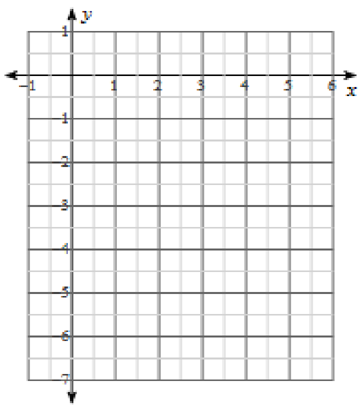


6) $y = -2(x+2)^2 + 4$

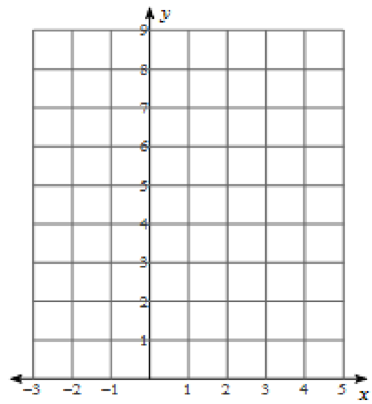


Assignment 3B.2 (Continued)

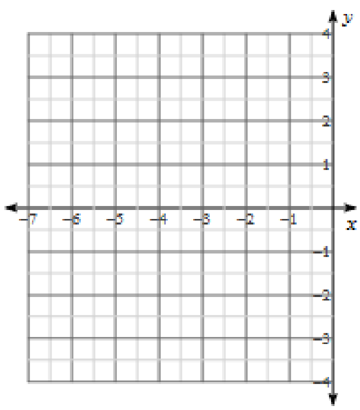
7) $y = -(x-4)^2 - 1$



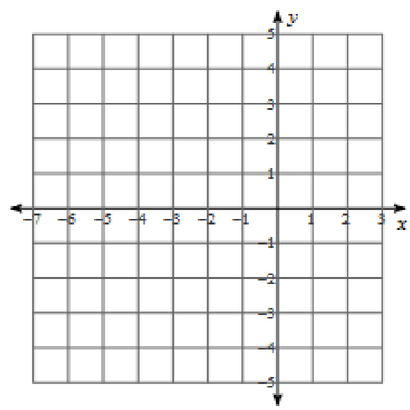
8) $f(x) = x^2 - 6x + 13$



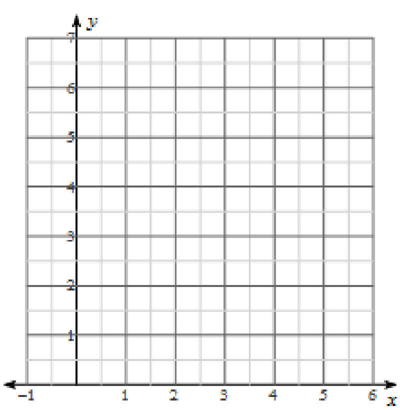
9) $y = x^2 + 8x + 14$



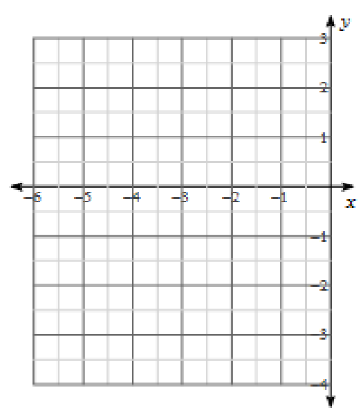
10) $y = -2x^2 - 8x - 4$



11) $y = x^2 - 8x + 18$

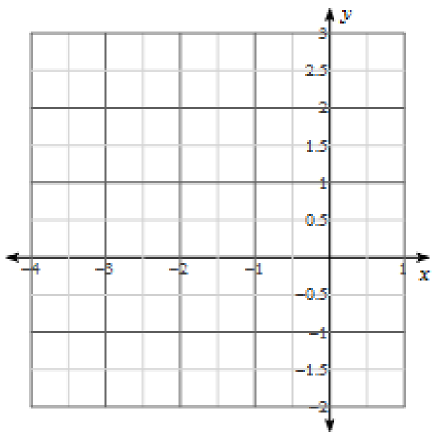


12) $y = \left(x + \frac{5}{2}\right)^2 - \frac{9}{4}$

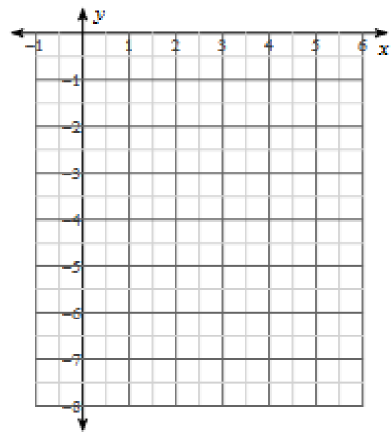


Assignment 3B.2 (Continued)

13) $y=\left(x+\frac{3}{2}\right)^2-\frac{5}{4}$



14) $y=-x^2+3x-6$



Identify the form of the quadratic equation and state the advantage of each.

15) $y = 5x^2 + 3x + 2$

16) $y = 5(x + 3)^2 - 2$

17) $y = (x - 3)^2$

18) $y = (x - 3)(x + 2)$

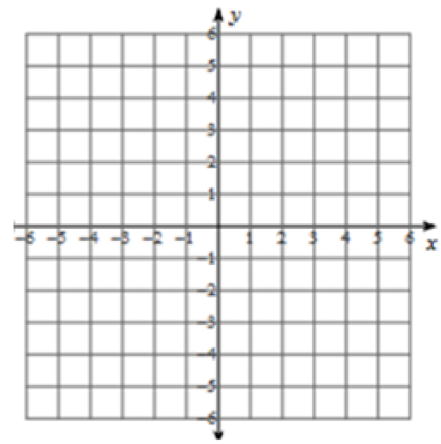
19) Put #16 into Standard Form

20) Put #18 into Standard From

Assignment 3B.2 (Continued)

21. Graph the following equations on the given axis and compare the slope of each over the following rang. [0,2]

(Graph all on this graph)



$y = \frac{5}{4}x - 1$

x	y
0	
2	

m=

$y = \frac{5}{4}x - 1$

x	y
0	
2	

m=

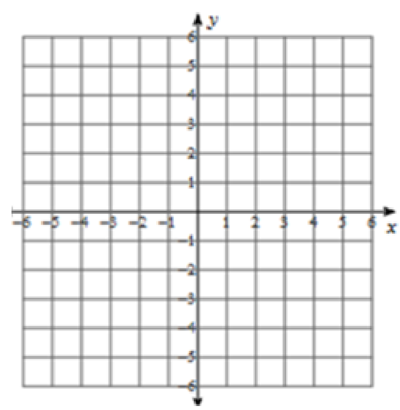
$y = \frac{5}{4}x - 1$

x	y
0	
2	

m=

21. Graph the following equation and interpret the average rate of change over each interval.

$$f(x) = x^2 + 8x + 19$$



[-6, -4]

x	y

m=

[-3,-1]

x	y

m=

[7,9]

x	y

m=

Unit 3B.3 – Quadratic Transformations

Student Learning Targets:

- I can perform transformations on quadratic functions with and without technology.
- I can describe the effect of each transformation on functions (e.g., If f(x) is replaced with f(x+k)).
- I can recognize which transformations take away the even nature of a quadratic function.
- I can, given the graph of a function, describe all transformations using specific values of k.

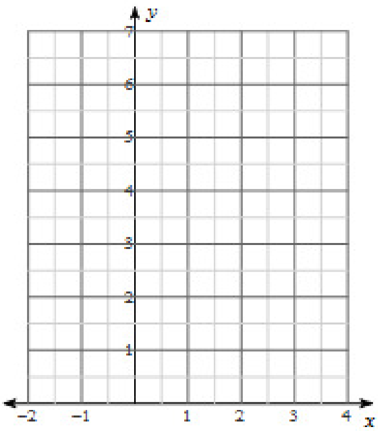
Notes:

Notes (Continued for 3B.3):

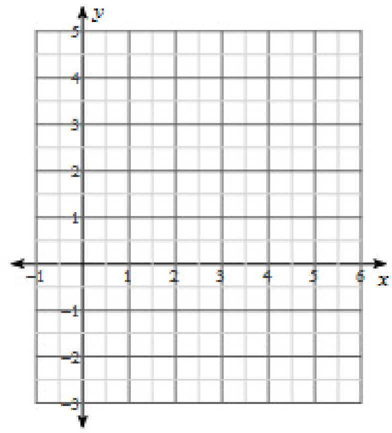
Assignment 3B.3

Graph each quadratic function. Label the transformations, vertex, axis of symmetry and domain and range.

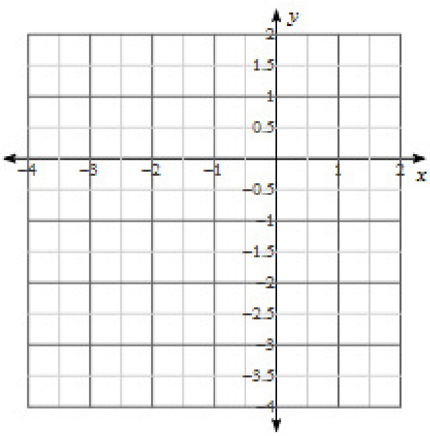
1) $y = (x-1)^2 + 2$



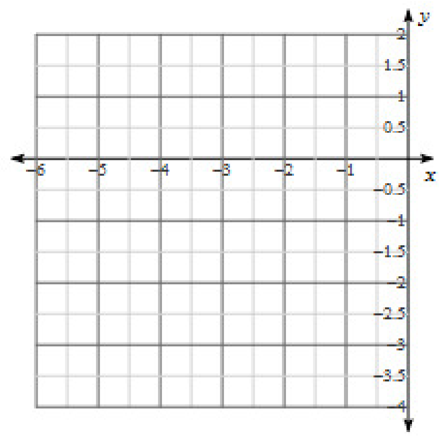
2) $y = (x-4)^2 - 1$



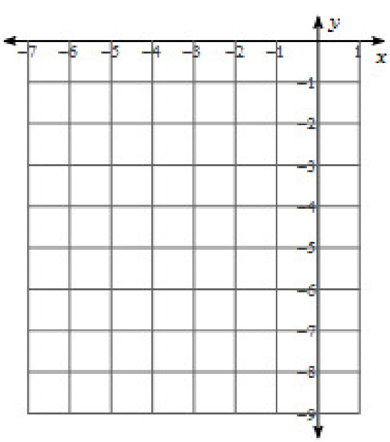
3) $y = (x+2)^2 - 3$



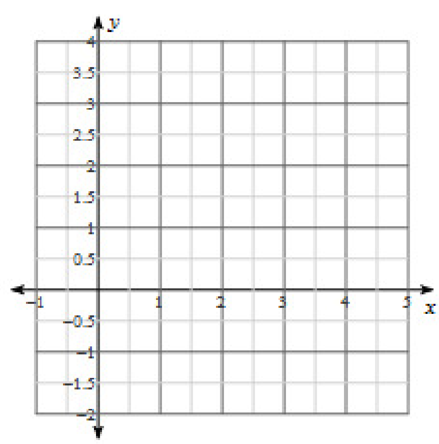
4) $y = -(x+2)^2 + 1$



5) $y = -(x+1)^2 - 4$

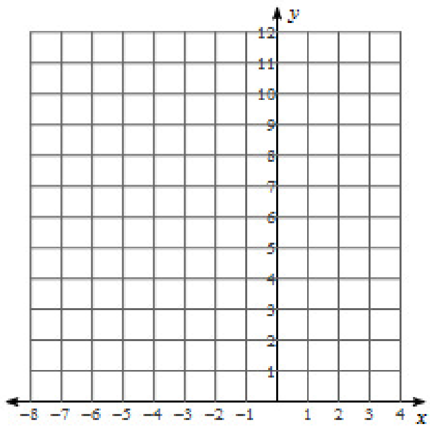


6) $y = -(x-2)^2 + 3$

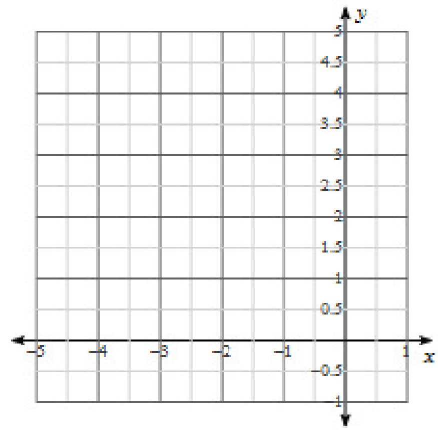


Assignment 3B.3 (Continued)

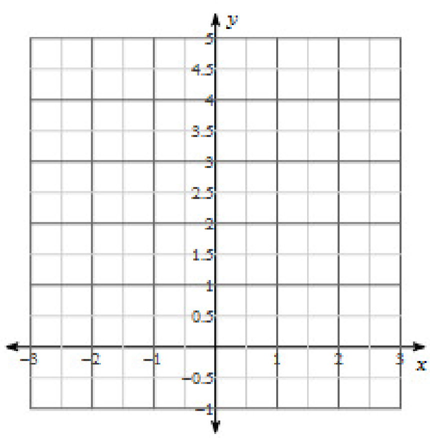
7) $f(x) = 2(x-1)^2 + 3$



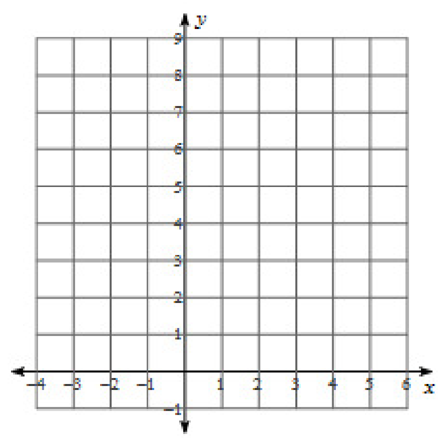
8) $f(x) = -(x+3)^2 + 4$



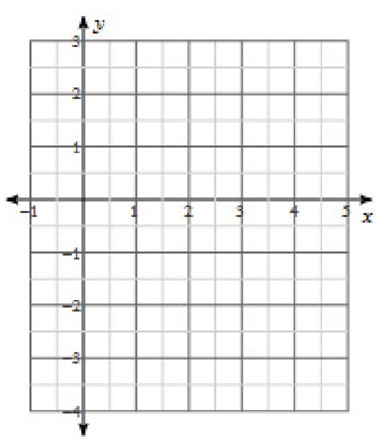
9) $f(x) = x^2$



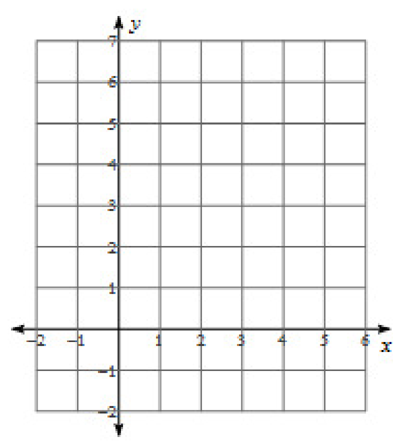
10) $f(x) = 2x^2$



11) $y = \left(x - \frac{5}{2}\right)^2 - \frac{9}{4}$



12) $y = 2\left(x - \frac{7}{2}\right)^2 - \frac{3}{2}$



Assignment 3B.3 (Continued)

Are these functions even? (Yes or No- Explain why)

13) $y = -x^2$

14) $y = 2x^2$

15) $y = 2(x+3)^2 - 3$

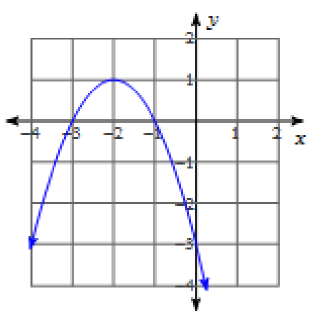
16) $y = (x+2)^2 + 3$

17) $y = x^2 + 5$

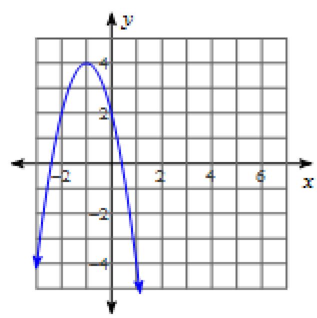
18) $y = (x-2)^2$

Label the transformations of the given graph. Write the equation of the function.

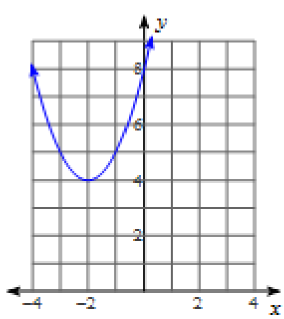
19)



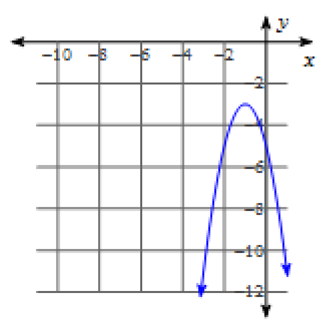
20)



21)



22)



Unit 3B.4 – Quadratic Behavior

Student Learning Targets:

- I can, given a function in a table or in algebraic or graphical form, identify key features such as x-and y-intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.
- I can identify domains of functions given a graph.

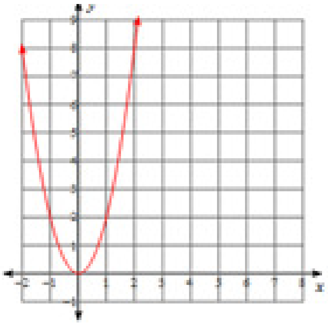
Notes:

Notes (Continued for 3B.4):

Assignment 3B.4

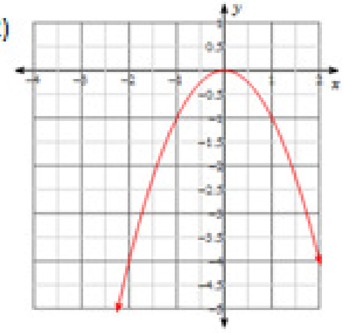
Identify the following for each function.

1)



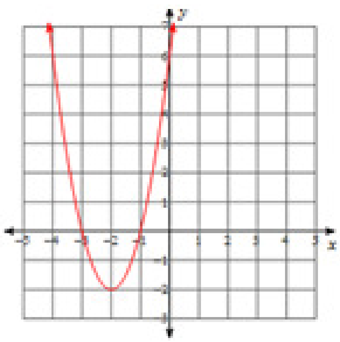
X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

2)



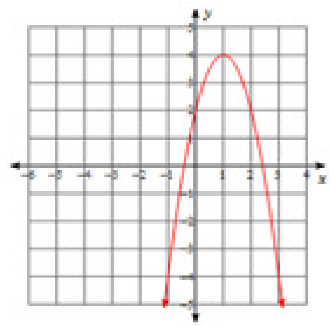
X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

3)



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

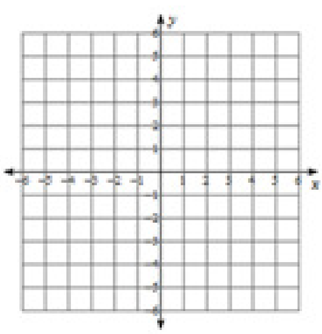
4)



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

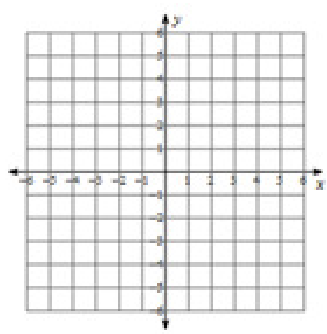
Graph and Identify the following for each function.

5) $y = (x-2)^2 + 4$



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

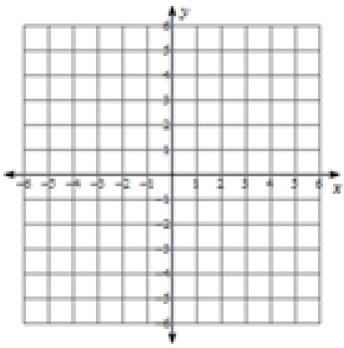
6) $y = (x-3)(x+2)$



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

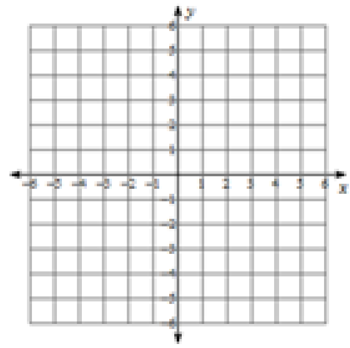
Assignment 3B.4 (Continued)

7) $y = -(x+3)^2 - 4$



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

8) $y = -x^2 + 2x + 15$



X intercept:
Y intercept:
Increasing:
Decreasing:
Maximum:
Minimum:
Symmetry:
End Behavior:
Domain:
Range:

9) Create a situation that could have produced the given data. Use appropriate vocabulary and key features to tell the story.

Time	f(t)
0	300
5	777.5
10	1010
15	997.5
20	740
25	237.5

Unit 3B.5 – Graphing Quadratics with Technology

Student Learning Targets:

- I can use technology to model quadratic functions, when appropriate.
- I can compare intercepts, maxima and minima, rates of change, and end behavior of two quadratic functions, where one is represented algebraically, graphically, numerically in tables, or by verbal descriptions, and the other is modeled using a different representation.

Notes:

Notes (Continued for 3B.5):

Assignment 3B.5

Solve the following problems. (A graphing calculator can be used when appropriate.)

1. Alexis jumps from a diving platform upward and outward before diving into the pool. The function $h = -9.8t^2 + 4.9t + 10$, where h is the height of the diver in meters above the pool after t seconds approximates Alexis's dive. Find the maximum height that she reaches and the equation of the axis of symmetry.

2. A decrease in smoking in the United States has resulted in lower death rates caused by lung cancer. The number of deaths per 100,000 people y can be approximated by

$y = -0.26x^2 - 0.55x + 91.81$, where x represents the number of years after 2000.

Year	Deaths per 100,000
2000	91.8
2002	89.7
2004	85.5
2010	60.3
2015	?
2017	?

a) Calculate the number of deaths per 100,000 people for 2015 and 2017.

b) Use the Quadratic Formula to solve for x when $y = 50$.

c) According to the quadratic function, when will the death rate be 0 per 100,000? Do you think that this prediction is reasonable? Why or why not?

3. The Demon Drop at Cedar Point in Ohio takes riders to the top of a tower and drops them 60 feet. A function that approximates this ride is $h = -16t^2 + 64t - 60$, where h is the height in feet and t is the time in seconds. About how many seconds does it take for riders to drop 60 feet?

4. The percent of U.S. households with high-speed Internet h can be estimated by

$h = -0.2n^2 + 7.2n + 1.5$, where n is the number of years since 1990.

a) Use the Quadratic Formula to determine when 20% of the population will have high-speed Internet.

b) Is a quadratic equation a good model for this information? Explain.

Assignment 3B.5 (Continued)

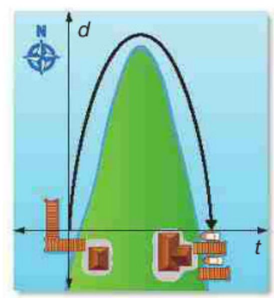
5. While Darnell is grounded his friend Jack brings him a video game. Darnell stands at his bedroom window, and Jack stands directly below the window. If Jack tosses a game cartridge to Darnell with an initial velocity of 35 feet per second, an equation for the height h feet of the cartridge after t seconds is $h = -16t^2 + 35t + 5$.

a) If the window is 25 feet above the ground, will Darnell have 0, 1, 2 chances to catch the video game cartridge?

b) If Darnell is unable to catch the video game cartridge, when will it hit the ground?

6. Miranda has her boat docked on the west side of Casper Point. She is boating over to the Casper Marina. The distance traveled by Miranda over time can be modeled by the equation

$d = -16t^2 + 66t$, where *d* is the number of feet she travels in *t* minutes.



a) Graph this equation.

b) What is the maximum number of feet north that she traveled?

c) How long did it take her to reach Casper Marina?

7. The marching band is selling poinsettias to buy new uniforms. Last year the band charged \$5 each, and they sold 150. They want to increase the price this year, and they expect to lose 10 sales for each \$1 increase. The sales revenue R, in dollars, generated by selling the poinsettias is predicted by the function $R = (5 + p)(150 - 10p)$, where p is the number of \$1 price increases.

a) Write the function in standard form.

b) Find the maximum value of the function.

c) At what price should the poinsettias be sold to generate the most sales revenue? Explain your reasoning.

8. The path of water from a sprinkler can be modeled by quadratic functions. The following functions model paths for three different sprinklers.

Sprinkler A: $y = -0.35x^2 + 3.5$ Sprinkler B: $y = -0.21x^2 + 1.7$

Sprinkler C: $y = -0.08x^2 + 2.4$

a) Which sprinkler will send water the farthest? Explain.

b) Which sprinkler will send water the highest? Explain.

c) Which sprinkler will produce the narrowest path? Explain.

Solve the following problems

9) Which has a greater average rate of change over the interval [5, 10]?

$f(x) = x^2{+}4$ or

Time	f(t)
0	300
5	777.5
10	1010
15	997.5
20	740
25	237.5

10) Represent two quadratic functions with a minimum of (0,2), one expressed in function notation and the other in a table.

11) Which of the following has a greater Maximum? Are there end behavior the same/different?

$f(x) = -x^2{+}4$ or

Time	f(t)
-2	1
-1	4
-.5	4.75
.5	4.75
1	4
2	1

Unit 3B.6 – Inverse Functions

Student Learning Targets:

- I can determine whether or not a function has an inverse, and find the inverse if it exists.
- I can understand that creating an inverse of a quadratic function requires a restricted domain.

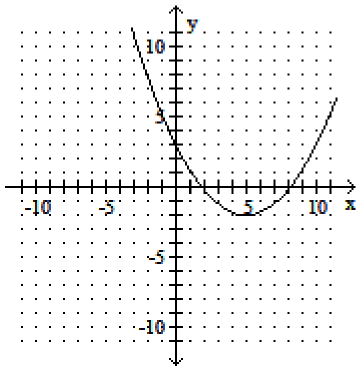
Notes:

Notes (Continued for 3B.6):

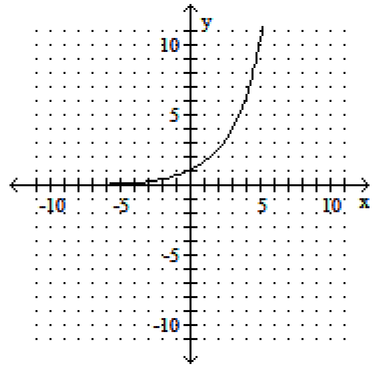
Assignment 3B.6

Determine whether the function has an inverse (is one-to one).

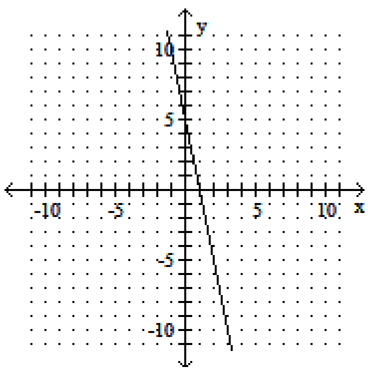
1.



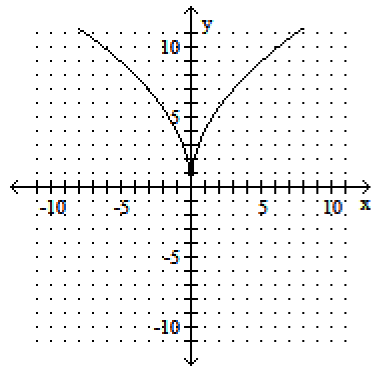
2.



3.



4.



5. $y = x + 5$

6. $y = |x - 2| + 3$

7. $y = (x - 2)^2 + 5$

8. $y = (x - 2)^2,\ x \geq 2$

Find the inverse. If no inverse exists then list a domain restriction and find the inverse using the restriction.

9. $y = 2x - 3$

10. $y = 6x - 5$

11. $y = x^2 - 3, x \geq 0$

12. $y = (x - 5)^2$

13. $y = x^3 + 7$

14. $y = \sqrt{x + 7}$

15. $y = (x + 2)^2 - 4$

16. $y = \frac{1}{x}$

Unit 3C.1 – Graphing Exponential Equations

Student Learning Targets:

- Use key features of an exponential function to graph the function.
- Given a function in a table or in algebraic form, identify key features such as domain & range, asymptotes and whether the function is a growth or decay.

Notes:

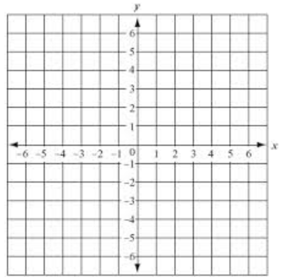
Notes (Continued for 3C.1):

Assignment 3C.1

Graph each function – include the asymptote. Then indicate whether the function is a growth or decay and state the domain and range.

1.

x	$y = 2^x + 1$
-3	$2^{-3} + 1 = 1.125$
-2	$2^{-2} + 1 = 1.25$
-1	$2^{-1} + 1 = 1.5$
0	$2^0 + 1 = 2$
1	$2^1 + 1 = 3$
2	$2^2 + 1 = 5$
3	$2^3 + 1 = 9$



Domain ___________

Range ____________

Growth or Decay?

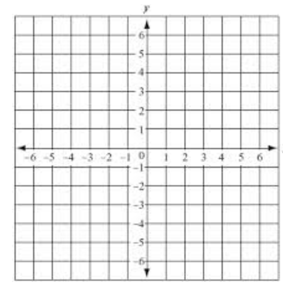
2.

x	-3	-2	$-\frac{1}{2}$	0	1	$\frac{3}{2}$	2
$y = 3^x$	$3^{-3} = \frac{1}{27}$	$3^{-2} = \frac{1}{9}$	$3^{-\frac{1}{2}} = \frac{\sqrt{3}}{3}$	$3^0 = 1$	$3^1 = 3$	$3^{\frac{3}{2}} = \sqrt{27}$	$3^2 = 9$

Domain ___________

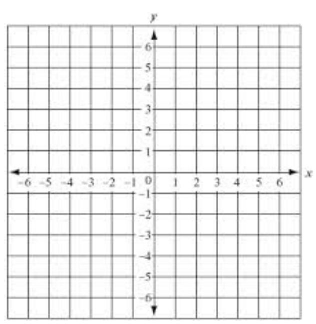
Range ____________

Growth or Decay?



3.

x	-2	-1	0	1	2	3
y	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8



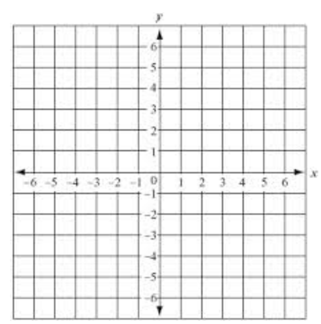
Domain ___________

Range ____________

Growth or Decay?

4.

x	-3	-2	-1	0	1	2
y	8	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$



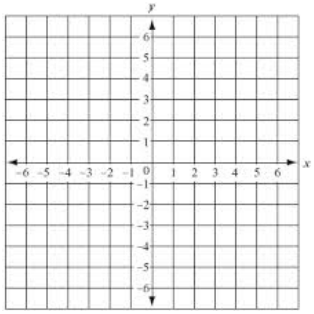
Domain ___________

Range ____________

Growth or Decay?

Assignment 3C.1 (Continued)

5. $f(x) = 2^{x+1} + 3$

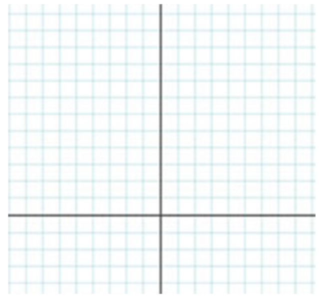


Domain ___________

Range ____________

Growth or Decay?

6. $f(x) = 3(2)^x + 8$

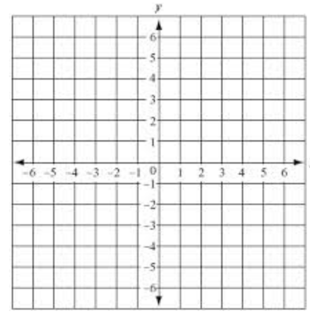


Domain ___________

Range ____________

Growth or Decay?

7. $f(x) = 2\left(\frac{2}{3}\right)^{x-3} - 4$

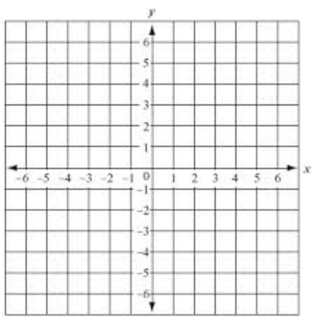


Domain ___________

Range ____________

Growth or Decay?

8. $f(x) = 2(3)^x$

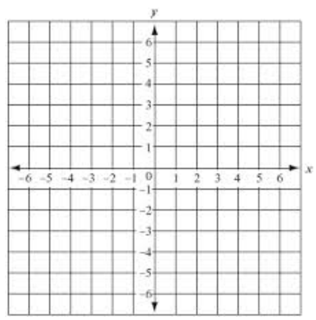


Domain ___________

Range ____________

Growth or Decay?

9. $f(x) = -2(4)^x$

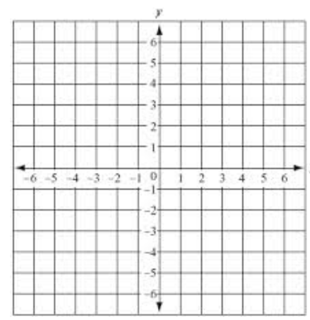


Domain ___________

Range ____________

Growth or Decay?

10. $f(x) = 4^{x+1} - 5$

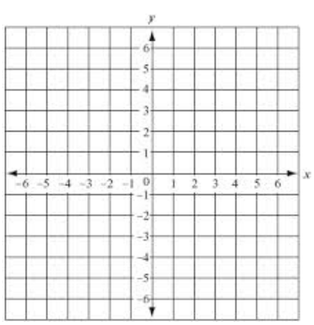


Domain ___________

Range ____________

Growth or Decay?

11. $f(x) = 3^{2x} + 1$

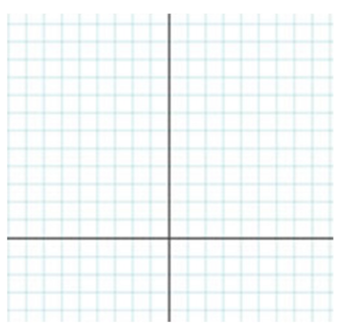


Domain ___________

Range ____________

Growth or Decay?

12. $f(x) = -0.4(3)^{x+2} + 9$

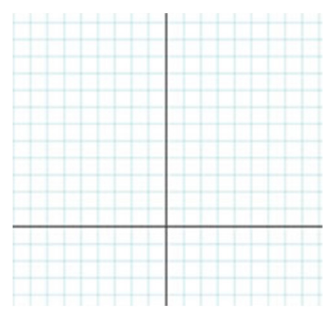


Domain ___________

Range ____________

Growth or Decay?

13. $f(x) = 1.5(2)^x + 6$



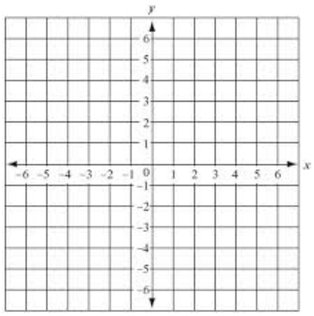
Domain ___________

Range ____________

Growth or Decay?

Assignment 3C.1 (Continued)

14. $f(x) = -4\left(\frac{3}{5}\right)^{x+4} + 3$

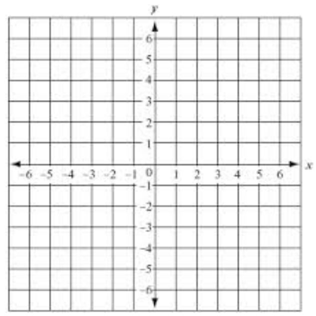


Domain ___________

Range ____________

Growth or Decay?

15. $f(x) = 3\left(\frac{2}{5}\right)^{x-3} - 6$

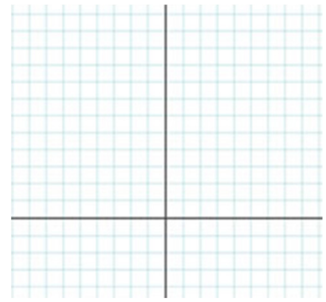


Domain ___________

Range ____________

Growth or Decay?

16. $f(x) = \frac{1}{2}\left(\frac{1}{5}\right)^{x+5} + 8$

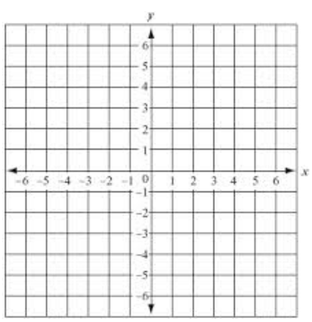


Domain ___________

Range ____________

Growth or Decay?

17. $f(x) = \frac{3}{4}\left(\frac{2}{3}\right)^{x+4} - 2$

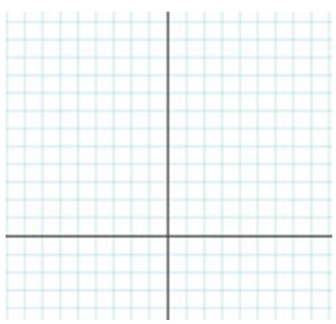


Domain ___________

Range ____________

Growth or Decay?

18. $f(x) = -\frac{1}{2}\left(\frac{3}{8}\right)^{x+2} + 9$

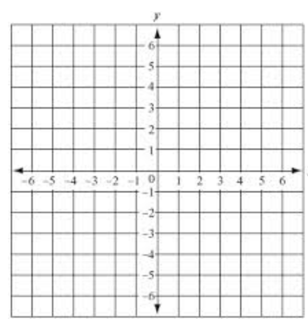


Domain ___________

Range ____________

Growth or Decay?

19. $f(x) = -\frac{5}{4}\left(\frac{4}{5}\right)^{x+4} + 2$



Domain ___________

Range ____________

Growth or Decay?

Unit 3C.2– Identify Linear, Quadratics, and Exponential

Student Learning Targets:

- Identify domains of functions given a graph.
- Identify a domain in a particular context.
- Compare rates of change in quadratic functions with those in linear or exponential functions.

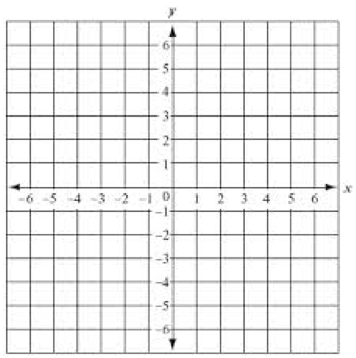
Notes:

Notes (Continued for 3C.2):

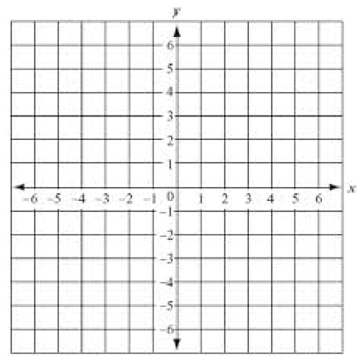
Assignment 3C.2

Graph each set of ordered pairs. Determine whether the ordered pairs represent a *linear* function, a *quadratic* function, or an *exponential* function. State the domain and range for each function.

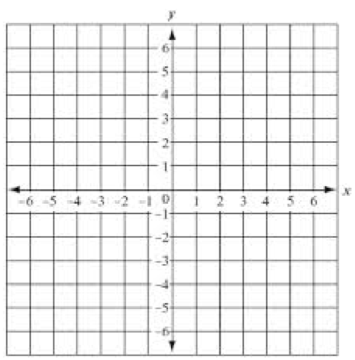
1. (-2, 8), (-1, 5), (0, 2), (1, -1)



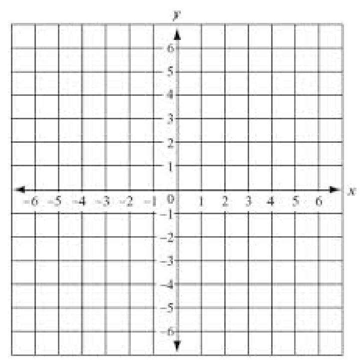
2. (-3, 7), (-2, 3), (-1, 1), (0, 1), (1, 3)



3. (-3, 8), (-2, 4), (-1, 2), (0, 1), (1, 0.5)



4. (0, 2), (1, 2.5), (2, 3), (3, 3.5)



Determine which kind of model best describes the data - a *linear* function ($y = mx + b$), a *quadratic* function ($y = ax^2$), or an *exponential* function ($y = ab^x$). Show the patterns that helped determine your answer. Then write an equation for the function that models the data.

5.

x	–1	0	1	2	3
y	1	3	9	27	81

6.

x	–5	–4	–3	–2	–1
y	125	80	45	20	5

7.

x	–3	–2	–1	0	1
y	1	1.5	2	2.5	3

8.

x	–1	0	1	2
y	–1.25	–1	–0.75	–0.5

Assignment 3C.2 (Continued)

9. The table shows the height of a plant for four consecutive weeks. Determine which kind of model best describes the data. Then write a function that models the data.

Week	0	1	2	3	4
Height (in.)	3	3.5	4	4.5	5

10. **WEB SITES** A company tracked the number of visitors to its Web site over 4 days. Determine which kind of model best represents the number of visitors to the Web site with respect to time. Then write a function that models the data.

Day	0	1	2	3	4
Visitors (in thousands)	0	0.9	3.6	8.1	14.4

11. **CALLING** The cost of an international call depends on the length of the call. The table shows the cost for up to 6 minutes.

Length of call (min)	1	2	3	4	5	6
Cost ($)	0.12	0.24	0.36	0.48	0.60	0.72

a. Graph the data and determine which kind of function best models the data.

b. Write an equation for the function that models the data.

c. Use your equation to determine how much a 10-minute call would cost.

12. **DEPRECIATION** The value of a car depreciates over time. The table shows the value of a car over a period of time.

Year	0	1	2	3	4
Value ($)	18,500	15,910	13,682.60	11,767.04	10,119.65

a. Determine which kind of function best models the data.

b. Write an equation for the function that models the data.

c. Use your equation to determine how much the car is worth after 7 years.

Unit 3C.3 – Writing Exponential Equations

Student Learning Targets:

- Given an exponential context, find an explicit algebraic expression or series of steps to model the context with mathematical representations.
- Distinguish linear, quadratic and exponential relationships based on equations, tables and verbal descriptions.

Notes:

Notes (Continued for 3C.3):

Assignment 3C.3

1. The population of a colony of beetles grows 30% each week for 10 weeks. If the initial population is 65 beetles, write the equation and graph the function that represents the situation.

2. The attendance for a basketball team declined at a rate of 5% per game throughout a losing season. Write the equation and graph the function modeling the attendance if 15 home games were played and 23,500 people were at the first game.

3. The function $\boldsymbol{P(x) = 2.28(0.9^x)}$ can be used to model the number of pay phone in millions *x* years since 1999.

    a. Classify the function representing this situation as either exponential growth or decay, and identify the growth or decay factor. Then graph the function – label your graph.

    b. Explain what the P(x)-intercept and the asymptote represent in this situation.

4. Each day, 10% of a certain drug dissipates from the system.

    a. Classify the function representing this situation as either exponential growth or decay, and identify the growth or decay factor. Then graph the function – label your graph.

Assignment 3C.3 (Continued)

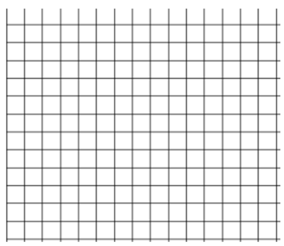
b. How much of the original amount remains in the system after 9 days.

c. If a second dose should not be taken if more than 50% of the original amount is in the system, when should the label say it is safe to redose? Explain your reasoning.

5. A sequence of numbers follows a pattern in which the next number is 125% of the previous number. The first number in the pattern is 18.

a. Write the function that represents the situation.

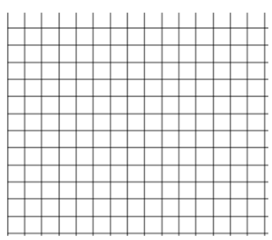
b. Classify the function representing this situation as either exponential growth or decay, and identify the growth or decay factor. Then graph the function for the first 10 numbers – label your graph.



c. What is the value of the tenth number? Round to the nearest whole number.

6. A cup of green tea contains 35 milligrams of caffeine. The average teen can eliminate approximately 12.5% of the caffeine from their system per hour.

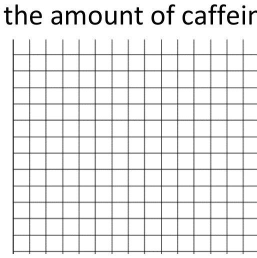
a. Write the equation and draw a graph to represent the amount of caffeine remaining after drinking a cup of green tea.



b. Estimate the amount of caffeine in a teenager's body 3 hours after drinking a cup of green tea.

7. A cup of black tea contains about 68 milligrams of caffeine.

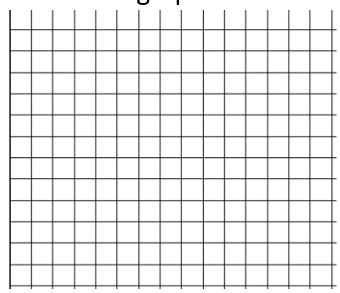
a. Write the equation and draw a graph to represent the amount of caffeine remaining in the body of an average teen after drinking a cup of black tea.



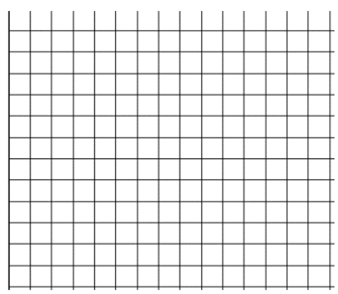
Assignment 3C.3 (Continued)

b. Estimate the amount of caffeine in the body 2 hours after drinking a cup of black tea.

8. A virus spreads through a network of computers such that each minute, 25% more computers are infected. If the virus began at only one computer, write an equation and graph the function for the first hour of the spread of the virus.

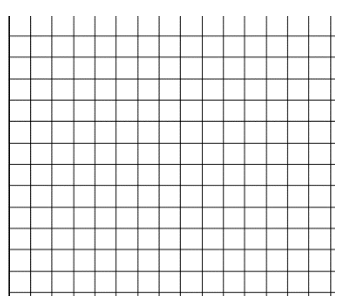


9. A new SUV depreciates in value each year by a factor of 15%. Write the equation and draw a graph of the SUV's value for the first 20 years after the initial purchase of $20,000.



10. The pressure of the atmosphere is 14.7 lb/in^2 at Earth's surface. It decreases by about 20% for each mile of altitude up to about 50 miles.

a. Write an equation and draw a graph to represent atmospheric pressure for altitude from 0 to 50 miles.



b. Estimate the atmospheric pressure at an altitude of 10 miles.

Unit 3C.4 – Combining Functions

Student Learning Targets:

- Combine linear, exponential, or quadratic functions using addition, subtraction, or multiplication.

Notes:

Notes (Continued for 3C.4):

Assignment 3C.4

1) $g(n) = 4n - 1$
$h(n) = 3n^2 + 2n$
Find $(g + h)(n)$

2) $h(n) = 2n + 4$
$g(n) = n^2 - 4$
Find $(2h + 3g)(n)$

3) $f(n) = n + 3$
$g(n) = n - 3$
Find $(f - g)(n)$

4) $g(n) = n + 5$
$h(n) = n^2 - 2$
Find $(g + h)(n)$

5) $f(x) = 3x - 5$
$g(x) = x^2 + 3x$
Find $(f \cdot g)(x)$

6) $f(x) = 2x$
$g(x) = x^2 + x$
Find $(f \cdot g)(x)$

7) $g(a) = 2a - 2$
$h(a) = -2a$
Find $(g - h)(a)$

8) $h(x) = x^3 + 1$
$g(x) = x + 5$
Find $(2h - 4g)(x)$

9) $g(n) = 2n + 2$
$f(n) = n^2 - 5$
Find $(g - f)(n)$

10) $g(n) = -n^2 + 1$
$h(n) = 4n$
Find $(g - h)(n)$

Assignment 3C.4 (Continued)

11) $h(x) = 4x + 1$
$g(x) = 3x + 5$
Find $(h - g)(x)$

12) $g(n) = 2n - 5$
$f(n) = 3n + 4$
Find $(2g + 4f)(n)$

13) $g(a) = a^3 + 2$
$f(a) = -4a - 4$
Find $(g \cdot f)(a)$

14) $g(n) = 3n - 2$
$f(n) = n^3 + 5$
Find $(g \cdot f)(n)$

15) $g(a) = 4a + 5$
$h(a) = -a^3 - 2a^2$
Find $(4g - h)(a)$

16) $f(x) = 3x + 3$
$g(x) = 2x + 1$
Find $(f \cdot g)(x)$

17) $f(n) = n + 1$
$g(n) = 2n^3 + 5n^2$
Find $(f - g)(n)$

18) $g(a) = 2a + 4$
$f(a) = 3a - 4$
Find $(g + f)(a)$

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

20) $f(x) = 3^x - 5$
$g(x) = 2x + 3$
Find $(f - g)(x)$