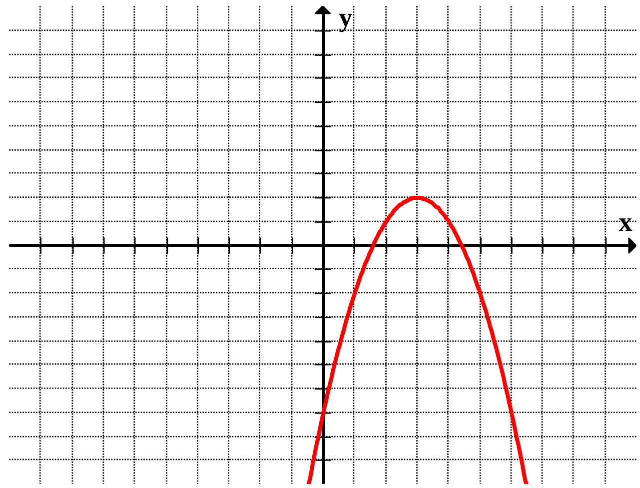
Name ____________________________________ Date ___________ Period _______

Pre-Calculus Unit 2 Practice Test—Answers

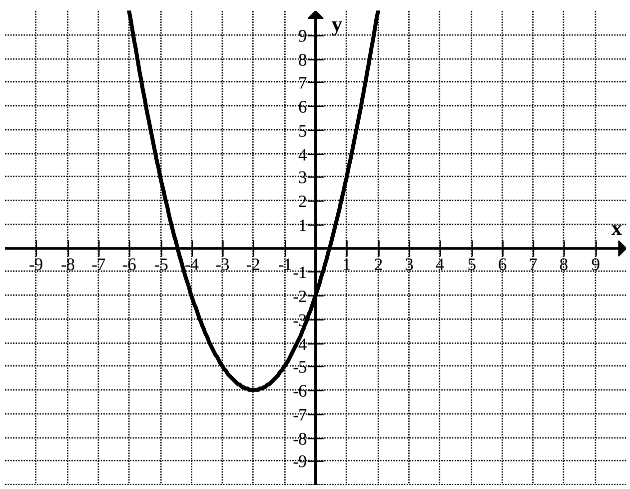
Learning Target 2A—I can use multiple transformations to determine the graph from an equation or vice versa for linear and quadratic functions. (No Calculator)

1. Use transformations of $y = x^2$ to graph $f(x) = -(x-3)^2 + 2$.

Vertex: $(3, 2)$



2. Write the equation of the graph below in vertex form.



$$\boldsymbol{y = (x+2)^2 - 6}$$

3. Find the vertex form for the equation of the function that is produced when the function $f(x) = x^2$ is shifted right by 5 units and down by 8.

$$\boldsymbol{f(x) = (x-5)^2 - 8}$$

4. Find the vertex form for the equation of the function that is produced when the function $f(x) = (x+2)^2 - 4$ is shifted right by 8 units and up by 1.

$$\boldsymbol{f(x) = (x-6)^2 - 3}$$

5. Find the vertex form for the equation of the function that is produced when the function $f(x) = x^2$ is flipped over the x-axis, shifted left 2 units, and down 5 units.

$$\boldsymbol{f(x) = -(x+2)^2 - 5}$$

6. Find the equation for $f(x) = (x-2)^2 + 6$ flipped over the x-axis and also if it was flipped over the y-axis.

$$\boldsymbol{x\text{-axis: } f(x) = -(x-2)^2 - 6}$$
$$\boldsymbol{y\text{-axis: } f(x) = (-x-2)^2 + 6}$$

Learning Target 2B—I can identify linear and quadratic correlations in data and use technology to define an appropriate linear or quadratic regression function.

7. A local business has determined that the number of items they can sell in a week can be modeled by the function $n = 160 - 5p$. The revenue is determined by the function $r = p \cdot n$.

a. Use substitution to write a function for the revenue r in terms of the price p.

$$\boldsymbol{r = p(160 - 5p)}$$
$$\boldsymbol{r = 1600p - 5p^2}$$

b. At what price will the business make the most revenue? Explain how you know this is the maximum.

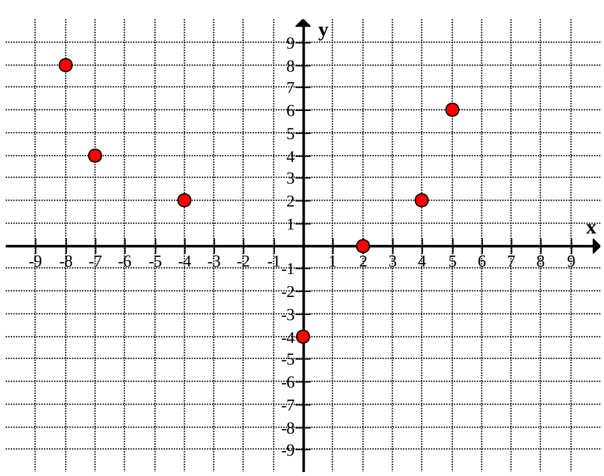
$$\boldsymbol{-\frac{b}{2a} = -\frac{160}{2(-5)} = -\frac{160}{-10} = 16}$$
$$\boldsymbol{p = \$16}$$

The maximum for a quadratic in standard form can be found by finding the vertex. The equation for the vertex is $-\frac{b}{2a}$.

c. What is the maximum profit that the business will earn using this model?

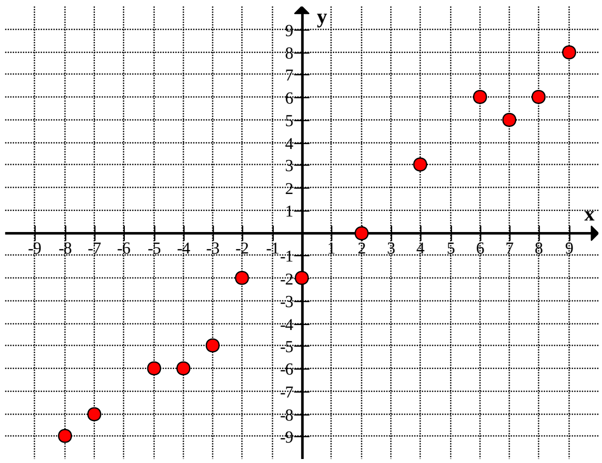
$$\boldsymbol{r = 160(16) - 5(16)^2 = 1280}$$

8. Write an equation that models the following function in the graph below.



$$\boldsymbol{y = .21x^2 + .40x - 2.09}$$

9. Write an equation that models the following function in the graph to the right.



$$y = .99x - 1.30$$

10. Use the data in the table below to answer the following questions.

x	1	2	3	4	5	6	7	8	9	10
y	5.1	6.2	6.5	6.8	9.4	10.5	13.6	16.1	20.2	26.3

a. Write the equation for a quadratic function that models the data in the table.

$$y = .29x^2 - 1.07x + 6.61$$

b. Use your regression model to predict y when $x = 15$.

$$y = .29(15)^2 - 1.07(15) + 6.61 = 55.81$$

11. Use the data in the table below to answer the following questions.

x	-5	-4	-3	-2	-1	0	1	2	3	4
y	-10	-8	-5	-2	0	0	4	6	7	10

a. Write the equation for a linear function that models the data in the table.

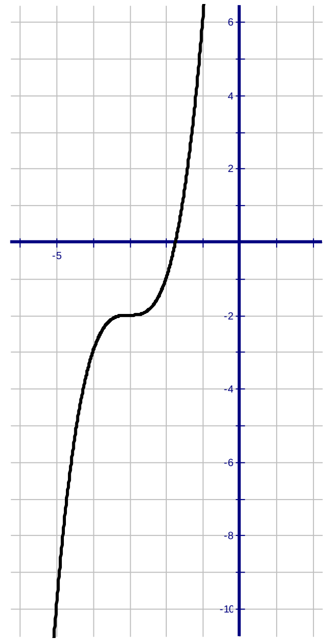
$$y = 2.17x + 1.28$$

b. Use your regression model to predict y when $x = 6$.

$$y = 2.17(6) + 1.28 = 14.3$$

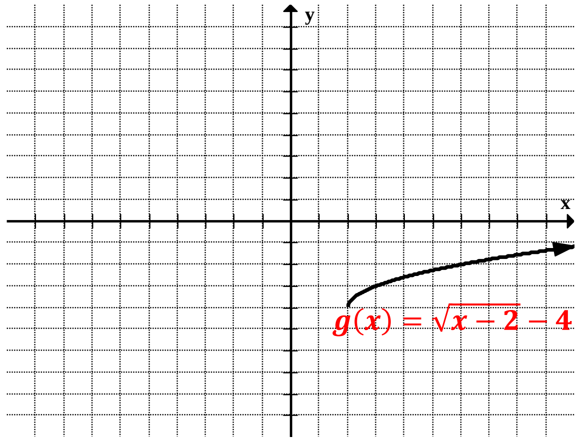
Learning Target 2C—I can represent and apply power functions, with integer and rational powers, as equations and graphs. (No Calculator)

12. Find the values of m and n that would produce the graph to the right in the function $f(x) = (x - m)^3 + n$.



$$\boldsymbol{f(x) = (x + 3)^3 - 2}$$
$$\boldsymbol{m = -3 \text{ and } n = -2}$$

13. Find the values of h and k that would produce the graph below in the function $g(x) = \sqrt{x - h} + k$.



$\boldsymbol{h = 2 \text{ and } k = -4}$

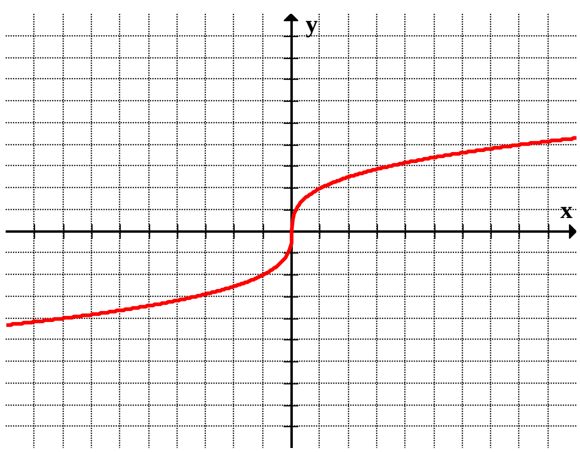
14. A certain power function of the form $f(x) = k \cdot x^a$ for some integer a. The graph contains the point $(0, 0)$ and the rest of the graph is in quadrant I and quadrant III. Describe the possible values for k and a in terms of positive, negative, even, or odd integers.

***k*=positive and *a*=odd**

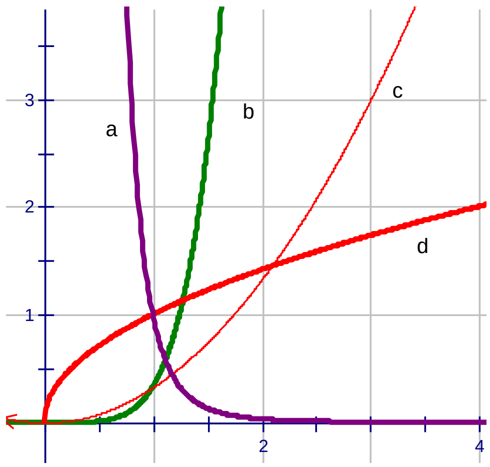
15. A certain power function of the form $f(x) = k \cdot x^a$ for some integer a. The graph does not contain the point $(0, 0)$ and the rest of the graph is in quadrant I and quadrant II. Describe the possible values for k and a in terms of positive, negative, even, or odd integers.

***k*=positive and *a*=negative even integer**

16. Graph $y = 2x^{\frac{1}{3}}$. **(Rewrite as $2\sqrt[3]{x}$ and made a table of values.)**

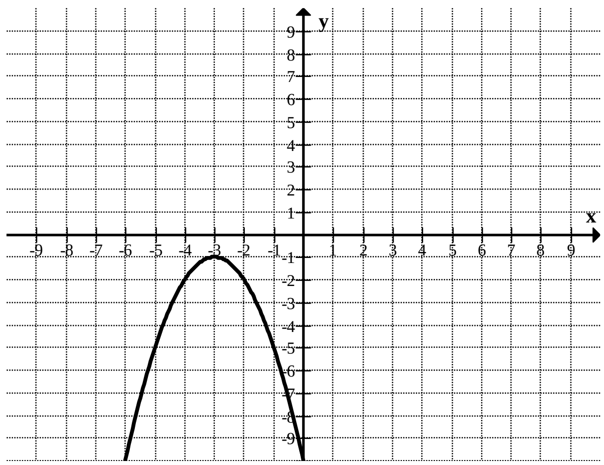


17. Which graph(s) below would have an equation of the form $y = x^{\frac{1}{n}}$ for some integer n? **(D)**



Learning Target 2D—I can identify key features of a parabola from its vertex form equation, and by converting a quadratic function from standard form to vertex form. (No Calculator)

18. Write a function for the graph below in standard form.



$\boldsymbol{y = -(x+3)^2 - 1}$

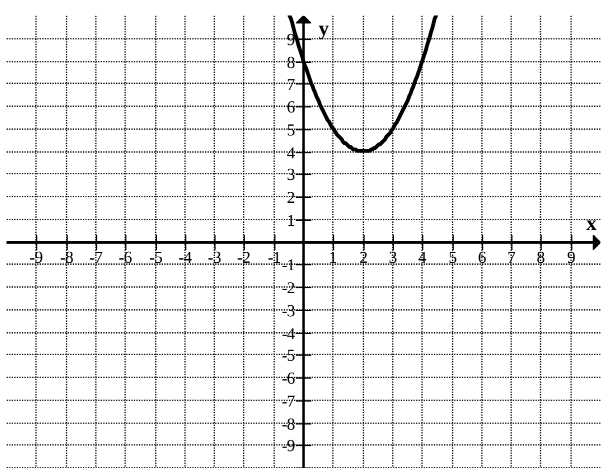
$\boldsymbol{y = -(x+3)(x+3) - 1}$

$\boldsymbol{y = -(x^2 + 6x + 9) - 1}$

$\boldsymbol{y = -x^2 - 6x - 9 - 1}$

$\boldsymbol{y = -x^2 - 6x - 10}$

19. Write a function for the graph below in standard form.



$\boldsymbol{y = (x-2)^2 + 4}$

$\boldsymbol{y = (x-2)(x-2) + 4}$

$\boldsymbol{y = x^2 - 4x + 4 + 4}$

$\boldsymbol{y = x^2 - 4x + 8}$

20. Write $f(x) = x^2 + 2x - 3$ in vertex form. Identify the vertex of $f(x)$, the max/min value, and the axis of symmetry. Then graph the function.

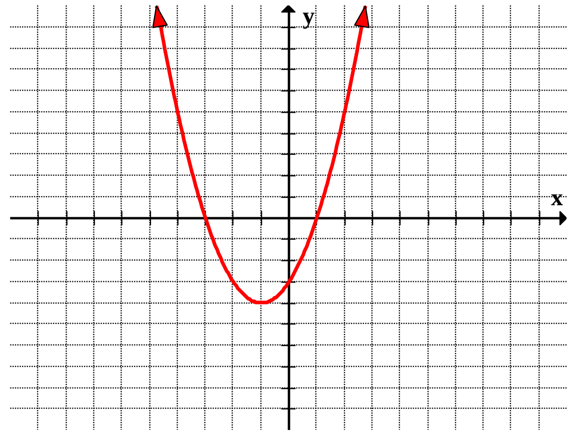
$$-\frac{2}{2(1)} = -1$$

$$f(-1) = 1 - 2 - 3 = -4$$

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

Vertex: $(-1, -4)$ **Min @** $(-1, -4)$

Axis: $x = -1$



21. Write $f(x) = -x^2 - x + 6.5$ in vertex form. Identify the vertex of $f(x)$, the max/min value, and the axis of symmetry.

$$\frac{1}{2(-1)} = -\frac{1}{2}$$

$$f\left(-\frac{1}{2}\right) = -\left(-\frac{1}{2}\right)^2 + \frac{1}{2} + 6.5$$

$$-\frac{1}{4} + \frac{1}{2} + 6.5$$

$$-.25 + .5 + 6.5$$

$$-.25 + 7 = 6.75$$

$$f(x) = -\left(x + \frac{1}{2}\right)^2 + 6.75$$

Vertex: $\left(-\frac{1}{2}, 6.75\right)$ **Max @** $\left(-\frac{1}{2}, 6.75\right)$ **Axis:** $x = -\frac{1}{2}$

Applications

22. A promotion for the Houston Astros downtown ballpark, a competition is held to see who can throw a baseball the highest from the front row of the upper deck of seats, 83 feet above the field. The winner throws the ball with an initial vertical velocity of 92 ft/sec and it lands on the infield grass. Use the function $s(t) = s_0 + v_0 t - \frac{1}{2}gt^2$ and use the gravitation constant $g = 32\ ft/sec$. $s(t) = 83 + 92t - \frac{1}{2}(32)t^2$

a. Find the maximum height of the ball.

$$-\frac{92}{2(-16)} = 2.875$$

$$s(2.875) = 215.25 \text{ feet}$$

b. How long did it take for the ball to reach its maximum height?

2.875 seconds

c. At what time (after $t = 0$) will $s(t) = 0$?

$\approx$ **6.5 seconds**

23. Write a quadratic equation in vertex form that starts at $(0, 0)$ and goes through $(10, 0)$.

Axis is $x = 5$ because it is halfway between the points since they have the same y-value.

$$y = -(x-5)^2 + k$$
$$0 = -(10-5)^2 + k$$
$$0 = -25 + k$$
$$k = 25$$
$$y = -(x-5)^2 + 25$$

24. The table below shows the average price for a gallon of milk. Let $x = 0$ stand for 1990, $x = 1$ for 1991, and so forth.

Year	Price of Milk
1990	$2.78
1995	$2.96
2000	$5.00
2005	$3.75
2010	$3.19

a. Find the linear regression model for the data. What does the slope in the regression model represent?

$$y = .03x + 3.21$$

The slope is the increase of price each year.

b. Use the linear regression model to predict the price of a gallon of milk for the year 2015.

$$x = 25 \text{ so } y = .03(25) + 3.21$$
$$y = \$3.96$$

c. Find the quadratic regression model for the data.

$$y = -.014x^2 + .305x + 2.533$$

d. Use the quadratic regression model to predict the price of milk for the year 2015.

$$x = 25 \text{ so } y = -.014(25)^2 + .305(25) + 2.533$$
$$y = \$3.78$$

e. Which model best represents the price of milk. Explain.

Quadratic seems to be the better fit looking at the graph.