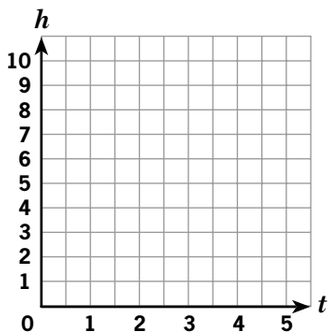
NAME _____ DATE _____

Module 14 Graphing Quadratic Relations
Lesson 3 Solving Problems Using Quadratic Graphs

independent practice

1. The equation $h = -16t^2 + 15t + 5$ describes the vertical height of a football, where h is the height in feet above the ground, and t is time in seconds. The ball is released at $t = 0$.

a. Graph the equation to show the height of the ball over time.



b. What is the initial height of the throw from the quarterback?

_____

c. What is the maximum height of the ball?

_____

d. How long will it take for the ball to reach maximum height?

_____

e. If the receiver can catch the ball 4 feet above the ground, how long will it take for the ball to be at the correct height?

_____

2. The local zoo is building a rectangular feeding pen for its giraffes. They have been given a donation of 40 meters of fencing.

a. Write an expression for the area of the feeding pen in terms of its width, w.

_____

b. What is the maximum area of the feeding pen?

_____

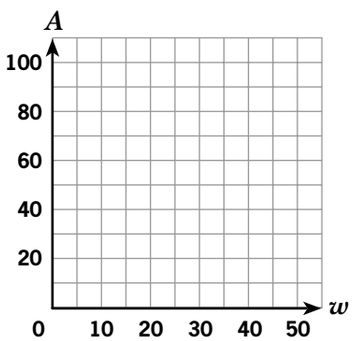
c. What length of the feeding pen will produce the maximum area?

_____

d. What shape is the feeding pen?

_____

e. Graph the equation for area to show the change in area for different widths.



Journal

The equation $h = -t^2 + 2t + 20$ describes the height of a rock tossed on plant Zonat, where h is the height in meters above the planet's surface and t is time in seconds.

1. Yewonde thinks the graph of this situation looks like Figure 1, and Raoul thinks it looks like Figure 2. Who is correct and why?

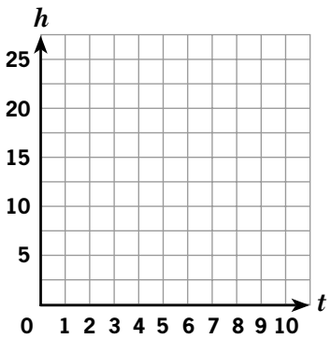


Figure 1

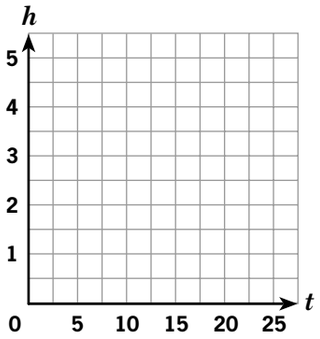


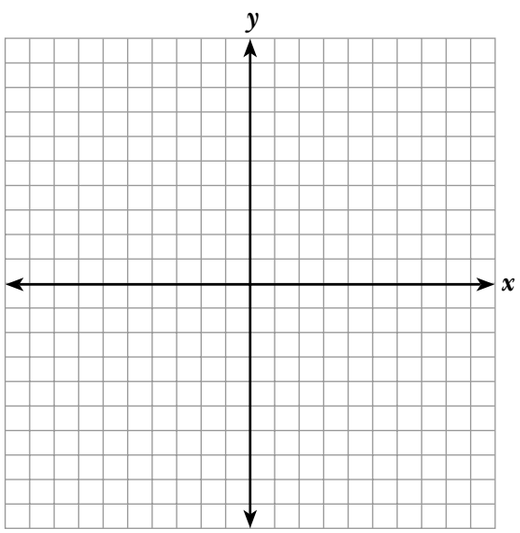
Figure 2

2. What is the shape of the graph that describes the height of the rock?
3. Explain how to find the initial height of the rock.
4. Explain how to find the maximum height of the rock.
5. Explain how to find the time it took for the rock to reach the planet's surface.

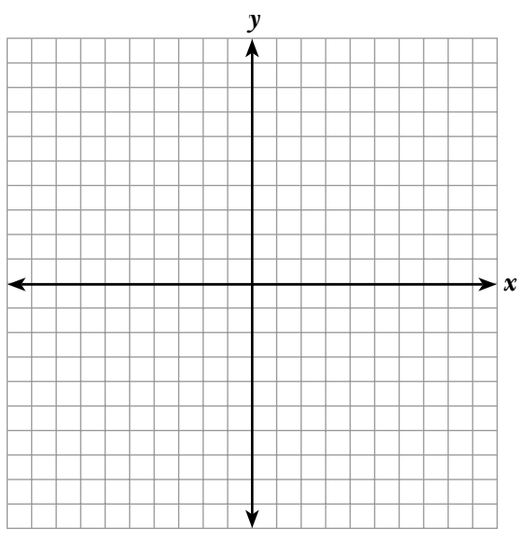
Cumulative Review

Graph.

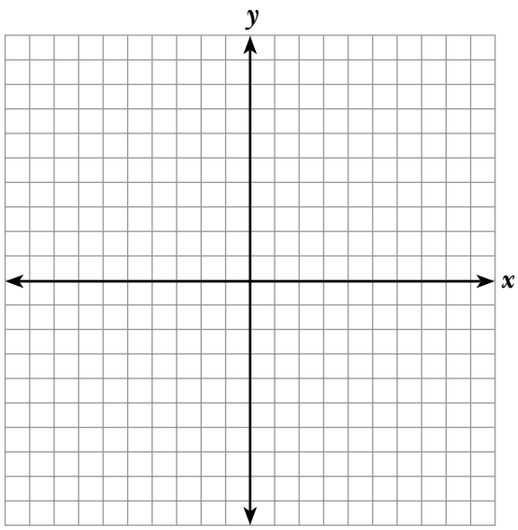
1. $y = -2(x - 3)^2 + 2$



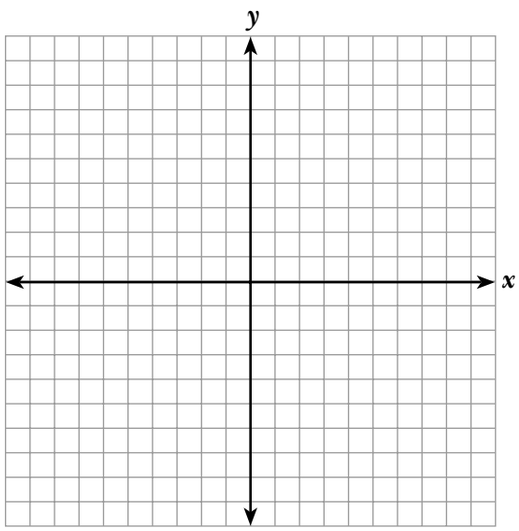
2. $y = 3(x + 4)^2 - 3$



3. $y = 2x^2 + 4x + 3$



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



Calculator Problem

Consider the equation $y = -16\left(x - \frac{1}{2}\right)^2 + 5$.

1. Press Y= and enter the function $-16\left(x - \frac{1}{2}\right)^2 + 5$ into $\mathbf{Y_1}$**=**. See Figure 1.

2. Press GRAPH. See Figure 2. (You may want to set the window measurement as in Figure 3.)

3. Since the graph of the equation opens down, the vertex of the graph is the point with the maximum *y* value. From the **CALC** menu, select **4:maximum. Left Bound?** will appear in the lower left hand corner of the screen. Use the arrow keys to move the cursor to the left of what appears to be the vertex; press ENTER. **Right Bound?** will appear in the lower left hand corner of the screen. Use the arrow keys to move the cursor to the right of what appears to be the vertex; press ENTER. **Guess?** will appear in the lower left hand corner of the screen; press ENTER. See Figure 4. The *x* and *y* values are in the lower left hand corner of the screen.

4. To find the *x*-intercept from the **CALC** menu select **2:zero. Left Bound?** will appear in the lower left hand corner of the screen. Use the arrow keys to move the cursor to the left of what appears to be the *x*-intercept just above the *x*-axis; press ENTER. **Right Bound?** will appear in the lower left hand corner of the screen. Use the arrow keys to move the cursor to the right of what appears to be the *x*-intercept just below the *x*-axis; press ENTER. **Guess?** will appear in the lower left hand corner of the screen, press ENTER. The *x* and *y* values are in the lower left hand corner of the screen. See Figure 5.

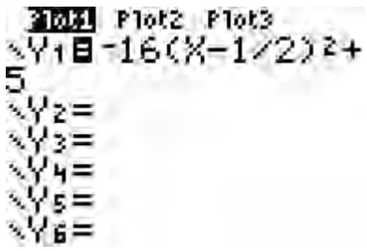


Figure 1

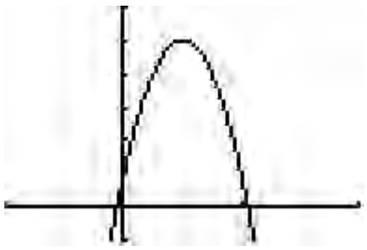


Figure 2

Figure 3

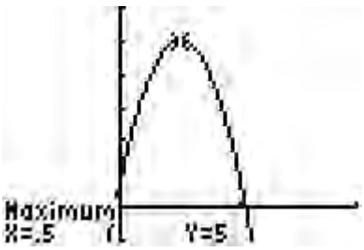


Figure 4

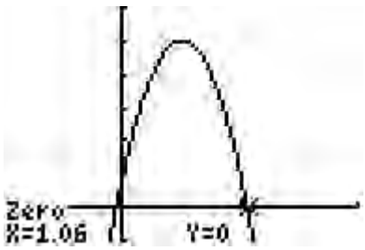


Figure 5

Given these projectile equations, where *t* is in minutes and *h* is in feet, find the maximum height attained and its *t*-intercept.

1. $h = -16t^2 + 3$ _____

_____

2. $h = -(4.9t - 4)2t + 5$ _____

_____

3. $h = -32t^2 + 2t + 15$ _____

_____

4. $h = -8t^2 + 5t + 1$ _____

_____