Interpreting Graphs of Quadratics

agenda

Warm-Up

HW Check

Notes (p.115)

Activity

HW (2 pages)

reminders

Late HW & extra credit due TOMORROW by 4:10

Bathroom passes due Thursday

Test & Notebook Check Friday (next six weeks)

On the sticky note at your table, write the table number and NUMBER of internet capable devices your entire table has access to during class.

Warm-Up (Tuesday)

1. Which coordinate pair is in the solution set for $y < -\frac{5}{2}x + 7$?

X y

A. (4, -3)

B. (1, 2)

C. (5, 6)

D. (0, 7)

$-3 \overset{?}{<} -\frac{5}{2}(4) + 7$

$-3 < -3$

Plug in & find true statement

End of 5th six weeks

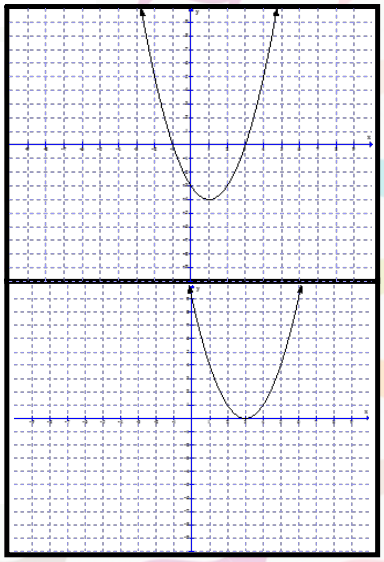
- All late HW due Wednesday
- Extra Credit due Wed (http://mskmathrhs.weebly.com)
- Bathroom passes due Thursday (make sure your name and period is on each one if separated)
- Progress report does not need to be signed (Please make note and return to bin if there is a problem)

Quiz Averages

2nd - 73 3rd - 73 4th - 67 5th - 75 7th - 64

HOMEWORK CHECK

1. B
2. Width = 5cm, length = 9cm
3. 4 m
4. Width = 5in, length = 10in
5. 12 and 14 OR -12 and -14
6. $4x^2 + 56x - 93 = 0$
7. Vertex: (1,-4)
   Minimum
   Concave Up
   Solutions: (-1,0) and (3,0)
   Domain: All real numbers
   Range: $y \geq -4$
8. Vertex: (3,0)
   Minimum
   Concave Up
   Solution: (3,0)
   Domain: All real numbers
   Range: $y \geq 0$
9. D



Algebra I - Unit 9: Topic 4 – Applications of Quadratics

Practice – Applications of Quadratics **pp 622-641**

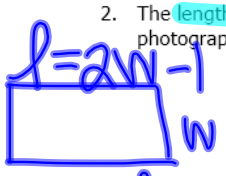
Name _____ Date _____ Period _____

1. An apple drops off the apple tree from a height of 8 feet. How long does it take to reach the ground? Use the function $f(t) = -16t^2 + 8$ where t is the time in seconds from when the apple was dropped, to find the answer.

   A 0.5 seconds
   B 0.71 seconds
   C 1 second
   D 2.23 seconds

Write an equation for each, then solve.

2. The length of a photograph is 1 cm less than twice the width. The area is 45 cm^2. Find the dimensions of the photograph.



$A = lw$

$45 = (2w-1)w$

$-45 \quad -45$

$0 = (2x-1)x - 45$

$w = 5$ cm

$l = 9$ cm

3. If the area of a rectangular garden is represented by the equation $2w^2 + w = 36$ where w is the width of the garden. What is the width of the garden in meters?

4. The length of a rectangle is twice the width. The area is 50 square inches. Find the dimensions of the rectangle.

5. The product of two consecutive even integers is 168. Find the integers.

Algebra I - Unit 9: Topic 4 – Applications of Quadratics

6. A garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. Write an equation in standard form that could be used to determine the width of the pathway. {Do not solve.}

$A = lw$

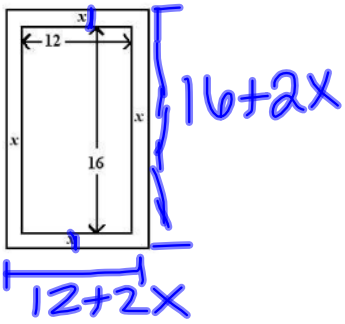
$285 = (16+2x)(12+2x)$

	16	2x
12	192	24x
2x	32x	$4x^2$

$285 = 4x^2 + 56x + 192$

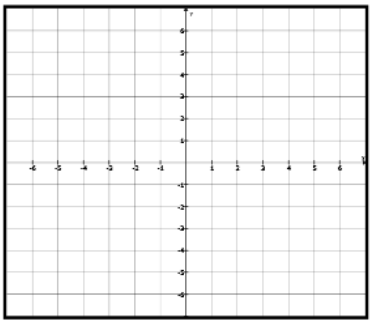
$-285 \quad -285$

$0 = 4x^2 + 50x - 93$



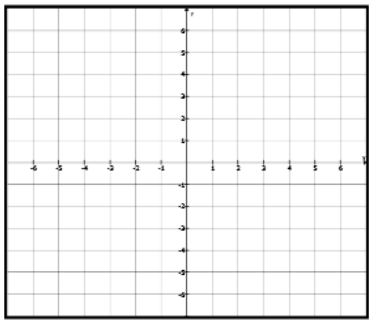
7-8. Graph each quadratic equation below, then fill in the information.

7. Graph the equation $y = x^2 - 2x - 3$.



Vertex: _____
Maximum or Minimum?
Concave Up or Concave Down?
Solution(s): _____
Domain: _____
Range: _____

8. Graph the equation $y - 9 = x^2 - 6x$



Vertex: _____
Maximum or Minimum?
Concave Up or Concave Down?
Solution(s): _____
Domain: _____
Range: _____

9. The circles below show a pattern.

Stage 1	
Stage 2	○ ○
Stage 3	○ ○ ○ ○ ○ ○
Stage 4	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

Which expression can be used to determine the number of circles at stage n?

A $n-1$
B $2n-1$
C n^2-1
D n^2-n

Interpreting Graphs of Quadratics

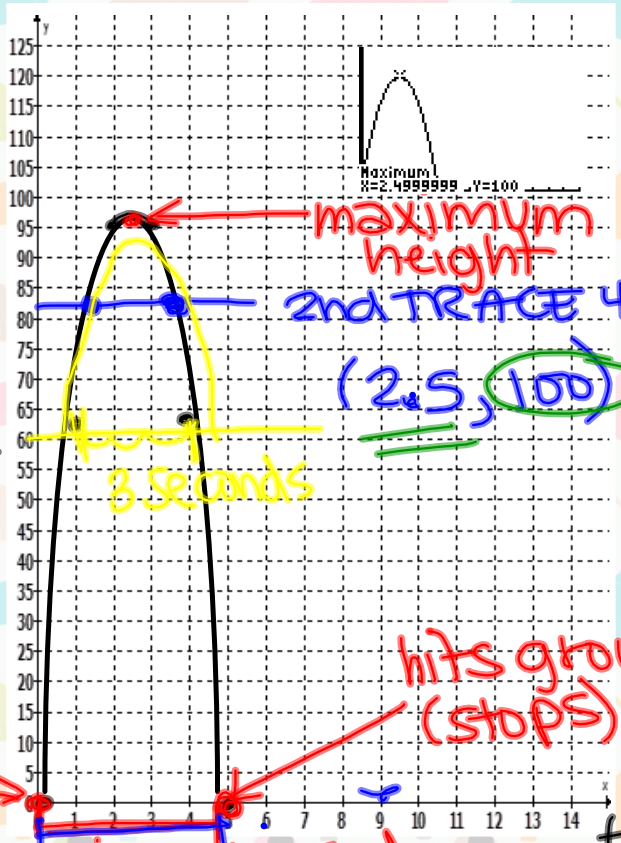
115

1. The height h (in feet) above the ground of a golf ball depends on the time, t (in seconds) it has been in the air. Jamal hits a shot off the tee that has a height modeled by the velocity function $f(t) = -16t^2 + 80t$.

$y = -16x^2 + 80x$

A. Create a table of values, then sketch the graph that represents this situation. Be sure to label your axes.

Time (t) in seconds	Height (h) in feet
0	0
1	64
2	96
3	96
4	64
5	0



B. How long is the golf ball in the air?

5 seconds

C. What is the maximum height of the ball?

100 feet

D. How long after it is hit does the ball reach the maximum height?

2.5 second

E. What is the height of the ball at 3.5 seconds?

~85 feet $f(3.5)$

F. Is there another time at which the ball is the same height?

If so, when?

yes, @1.5 seconds

G. How long is the ball 64 feet or higher in the air?

☆ 3 seconds (time elapsed)

Situation → no arrows

Domain: $0 \le x \le 5$ (time: start, stop)

Range: $0 \le y \le 100$ (height)

Interpreting Graphs of Quadratics

Take the interest survey. Answer honestly!

Write your name and final answer on a sticky note.

2 PAGES

Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Practice – Analyzing Quadratic Graphs **No Textbook Correlation**

Name _____ Date _____ Period _____

1. The height in feet above the ground of an arrow after it is shot can be modeled by $y = -16x^2 + 62x + 4$. Can the arrow pass over a tree that is 68 feet tall? Explain why or why not.

2. A superhero is trying to leap over a tall building. The function $h(t) = -16t^2 + 200t$ gives the superhero's height in feet as a function of time. The building is 612 feet high. Will the superhero make it over the building? Explain.

3. A rocket is launched from ground level with an initial velocity of 224 ft/s. The height, *h*, in feet of the rocket at any given time, *t*, in seconds is $h(t) = 224t - 16t^2$.

   A. When will the rocket reach a height of 528 feet?

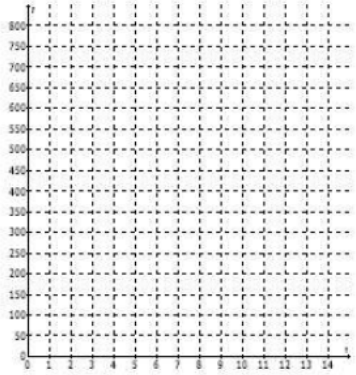
   B. When will the rocket reach the ground?

   C. When will the rocket reach its maximum height?

   D. What is the maximum height of the rocket?

   E. Graph this situation, labeling axes.

   F. State the domain and range of the situation.



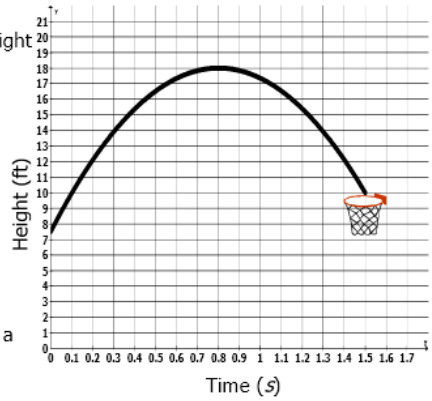
4. A basketball player takes a shot. The graph at the right shows the height of the ball, in feet, starting from when it leaves the player's hands.

   A. Estimate the height of the ball when it is released by the player?

   B. Approximately when does the ball reach its maximum height?

   C. What is the approximate maximum height?

   D. How long does it take the ball to reach the basket, which is set at a height of 10 feet?



Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

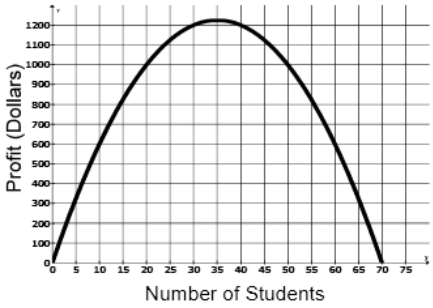
5. The amount of profit a travel agent will make is given by the formula $P = 70n - n^2$, where P is the amount of profit and n is the number of students who will take the trip. The graph at the right illustrates how the profit is dependent on the number of students.

   A. Approximately what number of students gives the travel agent the maximum profit?

   B. What is the domain of the situation?

   C. What is the meaning of this domain?

   D. How many students must take the trip in order for the agent to earn at least $1000?



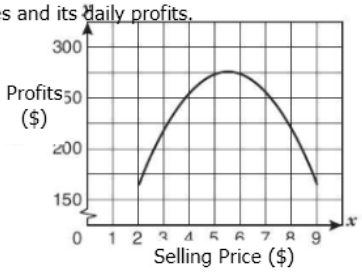
6. The table below shows h, the height in meters of a model rocket, versus t, the time in seconds after the rocket is launched. From the table, what conclusion can be made about the flight of the rocket?

Time in seconds	0	0.5	1	1.5	2	3	3.5	4.25
Height in meters	2	8	12.5	15	16	13	8.8	0

   A The rocket reached its maximum height after 2.5 seconds.
   B At 0 seconds the rocket was 2 meters off the ground.
   C The height of the rocket was 0 meters when it was launched.
   D The rocket was in flight for 5 seconds.

7. A bakery determines the following relationship between the price of its cakes and its daily profits. Which is the best conclusion that can be drawn from the graph?

   A As the selling price increases, the profits increase
   B The profits range from approximately $165 to $275.
   C An increase in the price of the cakes results in an increase in the number of cakes sold.
   D The maximum number of cakes that the bakery can sell is 275.



8. Michael threw a ball upward from the roof of a 40-foot-high building at an initial velocity of 40 feet per second. The table shows the relationship between the time elapsed and the ball's height above the ground. If the height of the ball is a quadratic function of time, between what times did the ball reach a height of 60 feet?

Time after Michael threw the ball (seconds)	Height of the ball above the ground (feet)
0	40
0.5	56
1	64
1.5	64
2	56
2.5	40

   A Between 0 seconds and 0.5 second

   B Between 1 second and 1.5 seconds

   C Between 0.5 second and 1 second and between 1.5 seconds and 2 seconds

   D Between 1 second and 1.5 seconds and between 1.5 seconds and 2 seconds

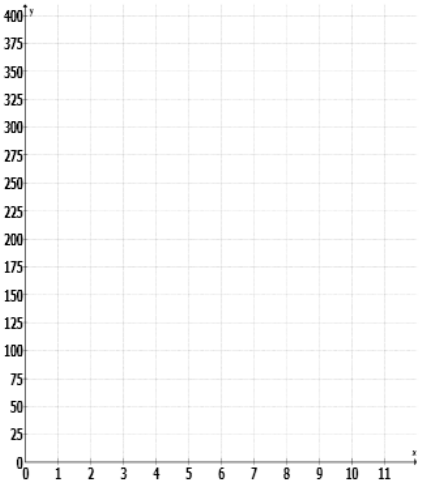
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 1 – Analyzing Quadratic Graphs

At a fireworks display, a rocket is launched upward from the ground with an initial velocity of 160 feet per second. The flight of the rocket is represented by the function $h(t) = -16t^2 + 160t$.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. How high is the rocket 3 seconds after it is launched?

C. When does it reach this height again?

D. What is the maximum height attained by the rocket?

E. How long did it take the rocket to reach the maximum height?

F. How long was the rocket in the air at or above 384 feet?

G. What is the domain and range of this situation?

Suppose the rocket is launched from the top of a 200 foot tall building.

A. Write the function that would represent this situation.

B. How long is the rocket in the air using this function, round to nearest hundredth?

C. What is the maximum height attained by the rocket?

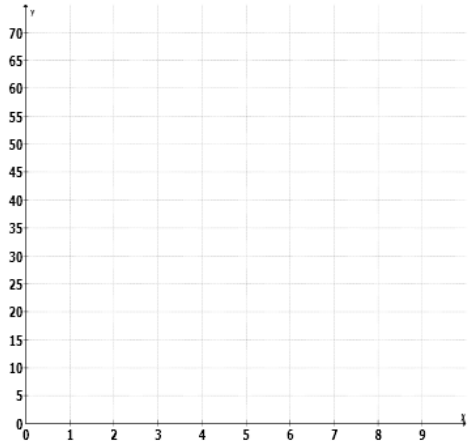
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 2 – Analyzing Quadratic Graphs

A baseball is thrown straight up into the air, traveling at an initial rate of 35 meters per second. The equation $d = 35t - 5t^2$ describes the approximate distance in meters, d, above the starting point at t seconds after the ball was thrown.

A. Use your calculator to complete the table and graph below labeling the axes.

x	y
0	



B. How high is the baseball 3 seconds after it is thrown?

C. When is the ball at a height of 50 meters above the starting point?

D. What is the approximate maximum height reached by the ball above its starting point, to the nearest hundredth?

E. How long did it take the baseball to reach its maximum height?

F. When does the ball return to its starting height?

G. How long was the baseball in the air at or above 60 feet?

H. What is the domain and range of this situation?

Suppose the baseball, when thrown, was released from a height of 4 meters from the ground.

A. Write the function that would represent this situation.

B. How long is the baseball in the air using this function, to nearest hundredth?

C. What is the maximum height attained by the baseball, to nearest hundredth?

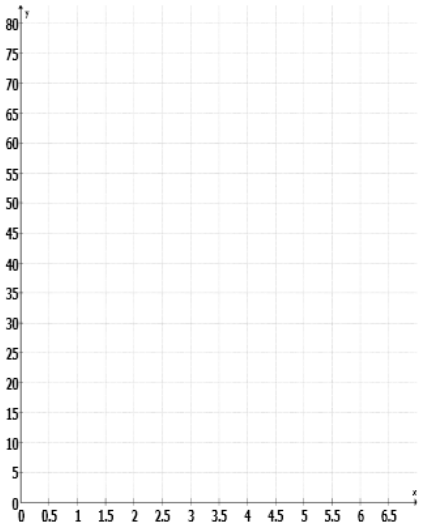
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 3 – Analyzing Quadratic Graphs

The punter on a special teams unit kicks a football upward from the ground with an initial velocity of 63 feet per second. The height of the football stadium is 70 feet. The height of the football with respect to time is modeled by the equation $h(t) = -16t^2 + 63t$.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. How long is the football in the air, to the nearest hundredth?

C. What is the height of the ball 1 second after it was kicked?

D. After approximately how many seconds is the ball 60 feet in the air?

E. At what time(s), if any will the football be the same height as the top of the stadium?

F. What is the approximate domain and range of the situation?

Suppose the same player messed around and kicked a ball from the stands, 15 feet above the field with the same initial velocity of the first kick.

A. Write a new function representing this change.

B. What effect will the new function have on the values in your table?

C. Sketch the new function on your original graph.

D. How did the graph change?

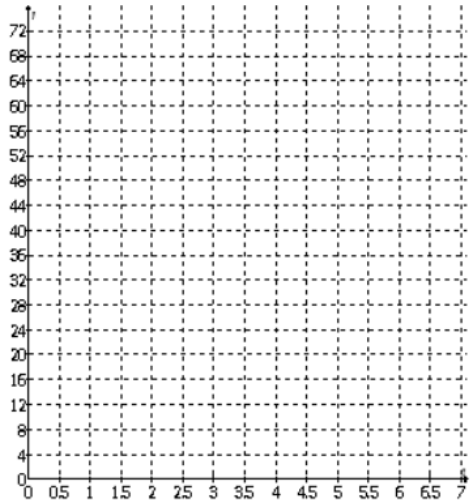
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 4 – Analyzing Quadratic Graphs

Olympic Softball Gold Medalist, Michelle Smith pitches a curveball with a speed of 64 feet per second. If she throws the ball straight upwards at this speed, the balls height, h (in feet) after t seconds is given by $h = -16t^2 + 64t$.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. How high is the softball 3 seconds after it is thrown?

C. When is the ball at a height of 60 feet above the starting point?

D. What is the approximate maximum height reached by the ball above its starting point?

E. How long did it take the softball to reach its maximum height?

F. When does the ball return to its starting height?

G. How long was the softball in the air at or above 60 feet?

H. What is the domain and range of this situation?

Suppose Michelle released the softball at a height of 3 feet from the ground.

A. Write the function that would represent this situation.

B. How long is the softball in the air using this function, to the nearest hundredth?

C. What is the maximum height attained by the softball?

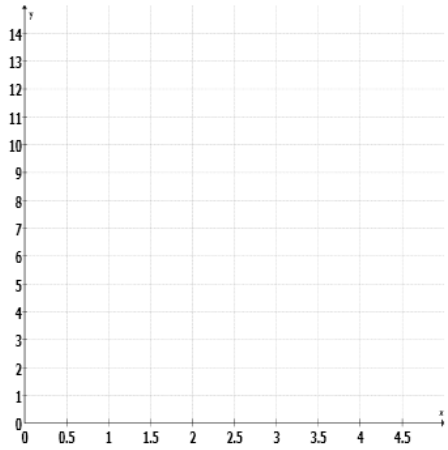
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 5 – Analyzing Quadratic Graphs

Winner of the 74th annual Hunger Games, Katniss Everdeen shoots an arrow straight up, from 3 meters above the ground, with a velocity of 14 meters per second. The arrow's height, h (in meters), in terms of t, time in seconds is given by the equation $h(t) = -5t^2 + 14t + 3$.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. How high is the arrow 3 seconds after it is shot?

C. When is the ball at a height of 12 meters above the starting point?

D. What is the approximate maximum height reached by the arrow above its starting point?

E. How long did it take the arrow to reach its maximum height?

F. When does the arrow return to its starting height?

G. When does the arrow hit the ground?

H. What is the domain and range of this situation?

Suppose Katniss stands on a platform that is 10 meters above the ground.

A. Write the function that would represent this situation.

B. How long is the arrow in the air using this function, to the nearest hundredth?

C. What is the maximum height attained by the arrow?

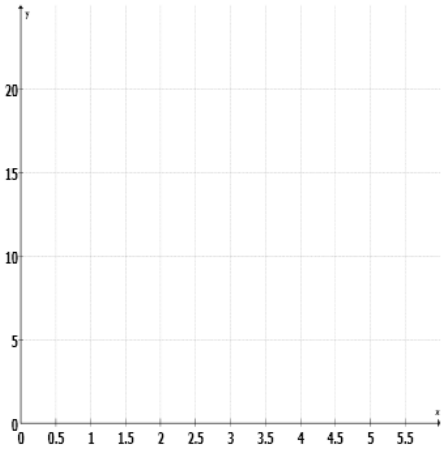
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 6 – Analyzing Quadratic Graphs

The profit of Mr. Unlucky's bicycle company can be represented by the equation $y = -3x^2 + 18x - 4$, where y is the amount of profit in hundreds of thousands of dollars and x is the number of years of operation. He realizes his company is on the downturn and wishes to sell before he ends up in debt.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. What is Mr. Unlucky's initial profit?

C. When will Mr. Unlucky's business show the maximum profit?

D. How much money does this business make at maximum profit?

E. At what time will it be too late to sell his business (when will he start losing money)?

F. What is the domain and range of the situation?

Suppose Mr. Unlucky's grandmother loaned him some money to supplement costs. The new function representing his profits is $y = -3x^2 + 18x + 6$

A. What effect will the new function have on the values in your table?

B. Now what is Mr. Unlucky's initial profit?

C. What is the new maximum profit?

D. If he has been operating for 5 years, how much profit can Mr. Unlucky expect to make?

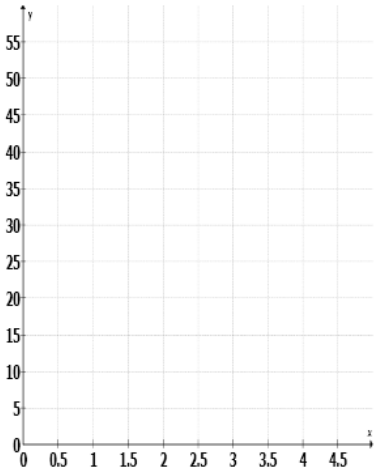
Algebra I - Unit 9: Topic 4 – Analyzing Quadratic Graphs

Group Work: Problem 7 – Analyzing Quadratic Graphs

At a swim meet, Janet dives from a diving board that is 48 feet high. Her position above the water is represented by the equation $h(t) = -16t^2 + 24t + 40$, where t represents the time in seconds since she left the board and h represents her height above the water, in feet.

A. Use your calculator to complete the table and graph below, labeling the axes.

x	y
0	



B. After how many seconds does Janet enter the water?

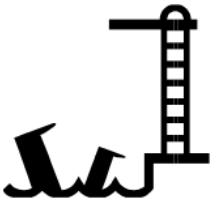
C. At what time(s) is Janet 24 feet above the water?

D. What is the greatest height Janet reaches in her dive?

E. How long does it take her to reach her maximum height?

F. What is the approximate domain and range of the situation?

Suppose Janet wants to try a dive from a lower diving board. The new board is 15 feet below the original board.



A. Write a new function representing this change.

B. What effect will the new function have on the values in your table?

C. Sketch the new function on your original graph.

D. How did the graph change?