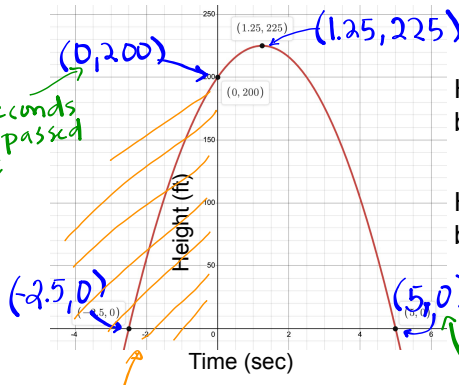
Warm Up

6/5

This graph models the situation of the height (ft) of a ball thrown up in the air from the top of a building.



(0,200)

0 seconds have passed
y-int

(1.25,225)

(-2.5,0)

(5,0)

How high is the building?

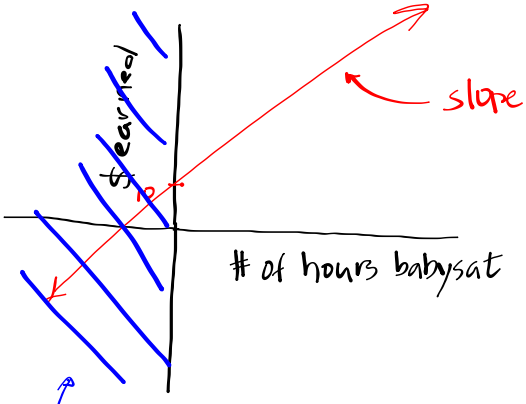
200 ft

How long before the ball hits the ground?

5 seconds

height = 0 ft

this info does NOT describe the problem



slope = $\frac{\Delta y}{\Delta x}$ $\frac{\$ \text{ earned}}{\#\text{ of hrs}}$

this info does NOT describe the problem

Problem 4.1 Recap

Problem 4.1

Suppose you throw a ball straight up in the air. This table shows how the height of the ball might change over time as it goes up and then returns to the ground.

Height of Thrown Ball

Time (seconds)	Height (feet)
0.00	0
0.25	15
0.50	28
0.75	39
1.00	48
1.25	55
1.50	60
1.75	63
2.00	64
2.25	63
2.50	60
2.75	55
3.00	48
3.25	39
3.50	28
3.75	15
4.00	0

A

1. Describe how the height of the ball changes over this 4-second time period.
2. Without actually making the graph, describe what the graph of these data would look like. Include as many important features as you can.
3. Do you think these data represent a quadratic function? Explain.

B The height h of the ball in feet after t seconds can be described by the equation $h = -16t^2 + 64t$.

Desmos

1. Graph this equation on your calculator.
2. Does the graph match the description you gave in Question A? Explain.
3. When does the ball reach a height of about 58 feet? Explain.
4. Use the equation to find the height of the ball after 1.6 seconds.
5. When will the ball reach the ground? Explain.

Problem 4.1

Suppose you throw a ball straight up in the air. This table shows how the height of the ball might change over time as it goes up and then returns to the ground.

A **1.** Describe how the height of the ball changes over this 4-second time period.

2. Without actually making the graph, describe what the graph of these data would look like. Include as many important features as you can.

3. Do you think these data represent a quadratic function? Explain.

- Height increases for 2 sec, then decreases
- Height increases decreasingly (fast at first, then slowing down)
- Once it reaches its max, decreases increasingly (slow at first, then faster)

Height of Thrown Ball

Time (seconds)	Height (feet)	1st diff	2nd difference
0.00	0		
0.25	15	+15	
0.50	28	+13	−2
0.75	39	+11	−2
1.00	48	+9	−2
1.25	55	+7	−2
1.50	60	+5	−2
1.75	63	+3	−2
2.00	64	+1	−2
2.25	63	−1	−2
2.50	60	−3	−2
2.75	55	−5	−2
3.00	48	−7	−2
3.25	39	−9	−2
3.50	28	−11	−2
3.75	15	−13	−2
4.00	0	−15	−2

1st x-int and y-int

LOS vertex

2nd x-int

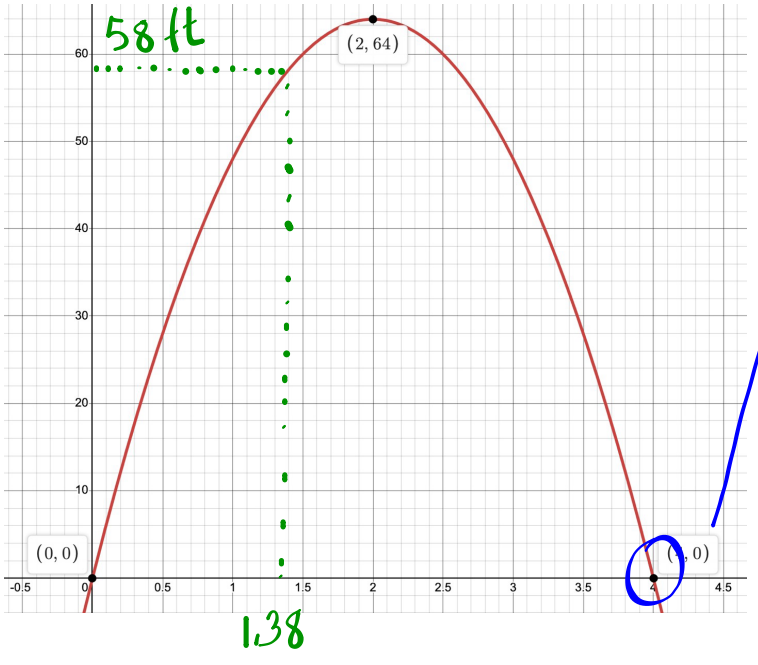
2nd difference constant → QUADRATIC

$y = -16x^2 + 64x$ $= -16x(x-4)$

B The height h of the ball in feet after t seconds can be described by the equation $h = -16t^2 + 64t$.

1. Graph this equation on your calculator.
2. Does the graph match the description you gave in Question A? Explain. yes
3. When does the ball reach a height of about 58 feet? Explain. 1.38 sec
4. Use the equation to find the height of the ball after 1.6 seconds.
5. When will the ball reach the ground? Explain. 2nd x-int

$y = -16x^2 + 64x$
$= -16(1.6)^2 + 64(1.6)$
$= 38.4$ ft



Reaches the ground after 4 seconds.

Homework Questions?

Page 80, #'s 1-3

What Key Features did you use?

1. A signal flare is fired into the air from a boat. The height h of the flare in feet after t seconds is $h = -16t^2 + 160t$.

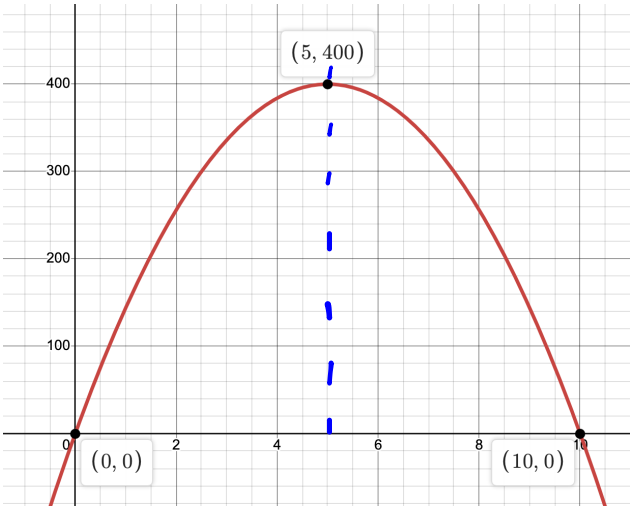
a. How high will the flare travel? When will it reach this maximum height?

y-value of vertex — LOS

b. When will the flare hit the water?

2nd x-int

c. Explain how you could use a table and a graph to answer the questions in parts (a) and (b).



What Key Features did you use?

2. A model rocket is launched from the top of a hill. The table shows how the rocket's height above ground level changes as it travels through the air.

a. How high above ground level does the rocket travel? When does it reach this maximum height?

b. From what height is the rocket launched?

c. How long does it take the rocket to return to the top of the hill?

y-value of vertex

LOS

y-int

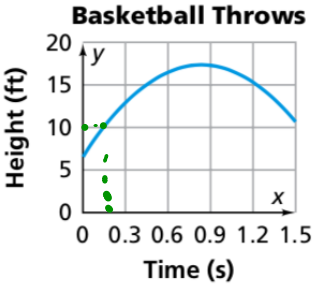
2nd x-int

Height of Model Rocket

Time (seconds)	Height (feet)
0.00	84
0.25	99
0.50	112
0.75	123
1.00	132
1.25	139
1.50	144
1.75	147
2.00	148
2.25	147
2.50	144
2.75	139
3.00	132
3.25	123
3.50	112
3.75	99
4.00	84

What Key Features did you use?

3. A basketball player throws the ball, attempting to make a basket. The graph shows the height of the ball starting when it leaves the player's hands.



a. Estimate the height of the ball when the player releases it.

b. When does the ball reach its maximum height? What is the maximum height?

c. How long does it take the ball to reach the basket (a height of 10 feet)?

Classwork

Quadratic Word Problems with Tables Name: _____

1) A jewelry maker would like to increase his profit by raising the price of his jade earrings. However, he knows that if he raises the price too high, he won't sell as many earrings and his profit will decrease.

The jewelry maker's business consultant develops the equation $P = 50s - s^2$ to predict the monthly profit, P, for a sales price, s. A table of a few data points are shown below.

s ($)	0	10	20	30	40	50	60
P ($)	0	400	600	600	400	0	-600

a) When the jewelry maker charges $10 for his earrings, how much profit does he make?

b) When the jewelry maker charges $15 for his earrings, how much profit does he make? Hint: use the equation.

c) What price will bring the maximum profit? How do you know?

d) What is the maximum profit? Hint: use your answer from **question c** and the equation.

e) When the jewelry maker charges $60 for his earrings, how much profit does he make? Explain what this means in the context of the problem.

f) If you were looking at the parabola, what graph key feature would have answered **question c**? (circle one)

y – intercept x – intercepts Line of Symmetry y value of Vertex

g) If you were looking at the parabola, what graph key feature would have answered **question d**? (circle one)

y – intercept x – intercepts Line of Symmetry y value of Vertex

2) The highest dive in the Olympic Games is from a 10-meter platform. The height above water, h (meters), of a diver t seconds after leaving the platform can be estimated by the equation $h = 10 + 4.9t - 4.9t^2$. A table with some of their data points is shown below.

Time (t)	Height (h)
0	10
0.2	10.784
0.4	11.176
0.6	11.176
0.8	10.784
1.0	10
1.2	8.824
1.4	7.256
1.6	5.296
1.8	2.944
2.0	0.2
2.2	−2.936

a) Approximately when will the diver hit the water's surface? How did you find this answer by using your table?

b) How could you find the answer to **question a** by using a graph? What key feature would help you?

c) After how many seconds will the diver be at their max height? How do you know?

d) What is the maximum height reached by the diver? Hint: Use your answer to **question c** and the equation.

e) After 2.2 seconds, the height is negative. Why would that make sense in the context of this problem?

Homework

Finish classwork