Warm Up

Go on to Desmos and plot the following parabolas on one graph:

$y = x^2$ $\quad$ $y = -x^2$

$y = 2x^2$ $\quad$ $y = -2x^2$

$y = 0.5x^2$ $\quad$ $y = -0.5x^2$

How does the value of "a" affect the graph of the parabola? ax^2+bx+c

Up/Down: 'a' positive opens up
'a' negative opens down

How wide: |a| is smaller → wider
|a| is large → narrow

ax^2+bx+c

up/down
wide/narrow

y-intercept

For Homework:

Find the key features for the following equations of parabolas and fill in the table below. Do all your work in your notebook.

1. $y = x^2 + 8x + 12$

2. $y = x^2 + 4x - 12$

Expanded Form	$x^2+8x+12$	$x^2+4x-12$
Factored Form	$(x+2)(x+6)$	$(x+6)(x-2)$
Key Features		
Opens Up/Down	Up	Up
y-intercept	$(0,12)$	$(0,-12)$
x-intercepts	$(-2,0)$ $(-6,0)$	$(-6,0)$ $(2,0)$
Line of Symmetry	$x=-4$	$x=-2$
Vertex	$(-4,-4)$	$(-2,-16)$

$(x+2)(x+6)$
$(-4+2)(-4+6)$
$(-2)(2)$
-4

$(x+6)(x-2)$
$(-2+6)(-2-2)$
$(4)(-4)$
-16

Agenda for today:

- Homework Check/Questions
- Problem 4.1 Launch
- Mini Quiz
- Keep working on Problem 4.1

What Is a Quadratic Function?

When you jump from a diving board, gravity pulls you toward Earth. When you throw or kick a ball into the air, gravity brings it back down. For several hundred years, scientists have used mathematical models to describe and predict the effect of gravity on the position, velocity, and acceleration of falling objects.

4.1 Tracking a Ball

Interpreting a Table and an Equation

No matter how hard you throw or kick a ball into the air, gravity returns it to Earth. In this Problem, you will explore how the height of a thrown ball changes over time.

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.

B The height h of the ball in feet after t seconds can be described by the equation $h = -16t^2 + 64t$. + 0

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.

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

Homework

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you can factor #1!

$h = -16t^2 + 160t$

$= 16t(-t + 10)$