Book on your desk.

We will use our calculators in class today.

Read in your novels.

Announcements

Exponents Test 2 Corrections are due on Friday

HF Chapters 17-20 are due Monday. We are getting close to the end of the book!

Hidden Figures Due Dates

- 17-20 due March 18
- 21-23 due March 25 → Book completed!

When we have finished the novel,
we will watch the movie!

Unit Map - Quadratics

Tuesday, 3/12/2019 - Standard Form of Graphing Quadratics
Wednesday, 3/13/2019 - Half-Day, HF Reading Day with Substitute Ms. Krupski
Thursday, 3/14/2019 - Quadratic Functions
Friday, 3/15/2019 - Solving Quadratic Equations by Graphing with Substitute Ms. Mitchell
Monday, 3/18/2019 - Solving Quadratic Equations by Factoring
Tuesday, 3/19/2019 - Solving Quadratic Equations by Completing the Square
Wednesday, 3/20/2019 - The Quadratic Formula
Thursday, 3/21/2019 - Vertex Form
Friday, 3/22/2019 - Quadratic Word Problems
Monday, 3/25/2019 - Word Problems Continued (NC Check-Ins) with Substitute Ms. Mitchell
Tuesday, 3/26/2019 - Systems of Linear and Quadratic Equations
Wednesday, 3/27/2019 - Review Day
Thursday, 3/28/2019 - Test Day
Friday, 3/29/2019 - Begin watching Hidden Figures

The Quadratics Test will be the first grade of the 4th Quarter.

Standard Form of Graphing

3/12/2019

A quadratic function is a type of nonlinear function that models certain situations where the rate of change is not constant. The graph of a quadratic function is a symmetric curve with the highest or lowest point corresponding to the maximum or minimum value.

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take note

Key Concept   Standard Form of a Quadratic Function

A **quadratic function** is a function that can be written in the form $y = ax^2 + bx + c$, where $a \neq 0$. This form is called the **standard form of a quadratic function.**

Examples $y = 3x^2$ $y = x^2 + 9$ $y = x^2 - x - 2$

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Standard Form: y =

Important Vocabulary

Y-Intercept → Where the graph crosses the y-axis

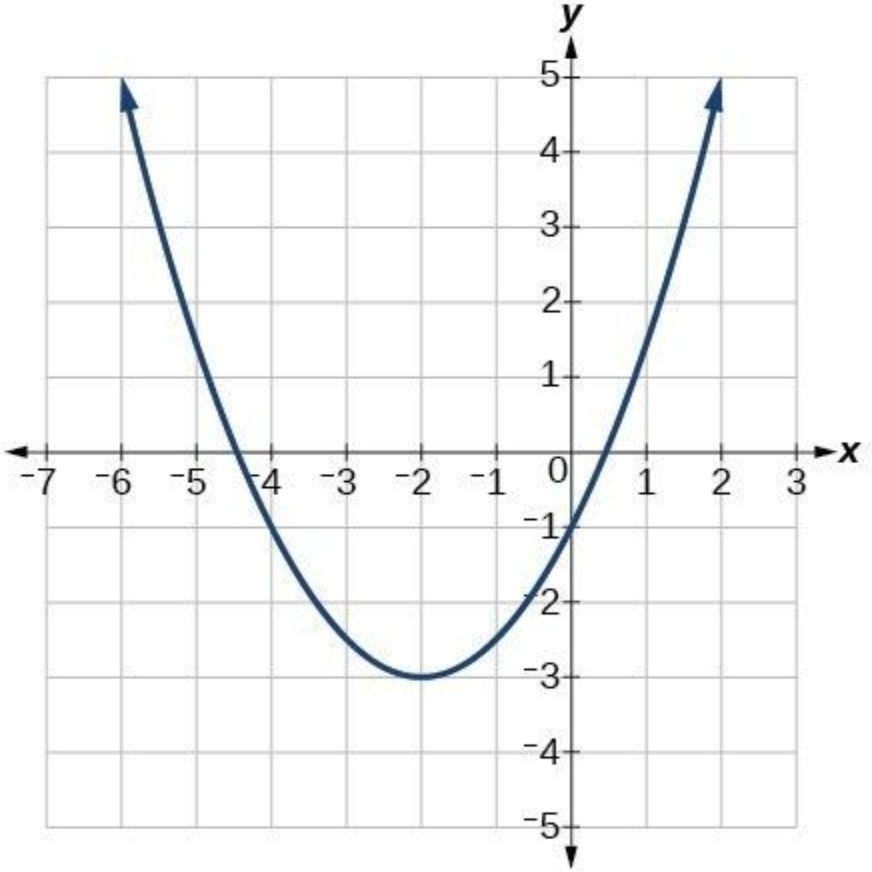
X-Intercept (root, zero, solution) → Where the graph crosses the x-axis. These are the solutions to the quadratic. They are also called roots or zeros of the equation.

Vertex → The highest or lowest point of the parabola

Axis of Symmetry → The line that divides the parabola into two matching halves. Each side matches exactly

Parabola → The graph of the quadratic function which is in the shape of a U

Check your understanding



Identify each of the vocabulary words on the graph shown to the left:

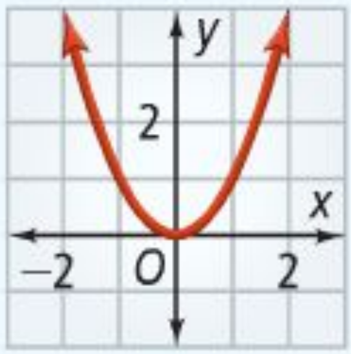
1) Y-Intercept
2) X-Intercept
3) Vertex
4) Axis of Symmetry
5) Parabola

The Quadratic Parent Function

The simplest quadratic function is f(x) = x^2 or y = x^2

This is called the **quadratic parent function**.

The graph of a quadratic function is a U-shaped curve called a **parabola.** The parabola with equation $y = x^2$ is shown at the right.



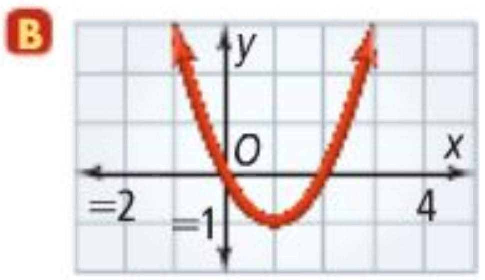
You can fold a parabola so that the two sides match exactly. This property is called *symmetry*. The fold or line that divides the parabola into two matching halves is called the **axis of symmetry.**

Identifying a Vertex

ax^2+bx+c

Parabola opens upward

Vertex is the **minimum** point or the lowest point of the parabola

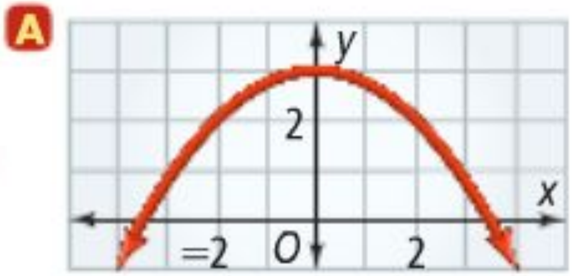


Find the vertex:

$-ax^2+bx+c$

Parabola opens downward

Vertex is the **maximum** point or the highest point of the parabola



Find the vertex:

Graphing $y = ax^2$

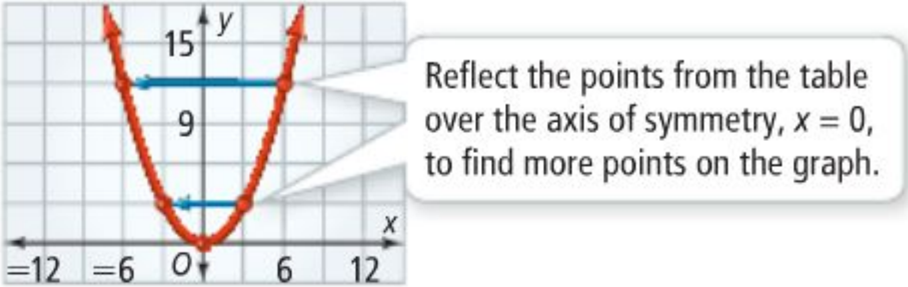
You can use the fact that a parabola is symmetric to graph it quickly.

- Find the coordinates of the vertex and several point on one side of the vertex
- Reflect the points across the axis of symmetry

Example 2: Graph $y = ax^2$

Graph the function $y = \frac{1}{3}x^2$. Make a table of values. What are the domain and range?

x	$y = \frac{1}{3}x^2$		(x, y)
0	$\frac{1}{3}(0)^2$	0	(0, 0)
3	$\frac{1}{3}(3)^2$	3	(3, 3)
6	$\frac{1}{3}(6)^2$	12	(6, 12)



The domain is all real numbers. The range is $y \geq 0$.

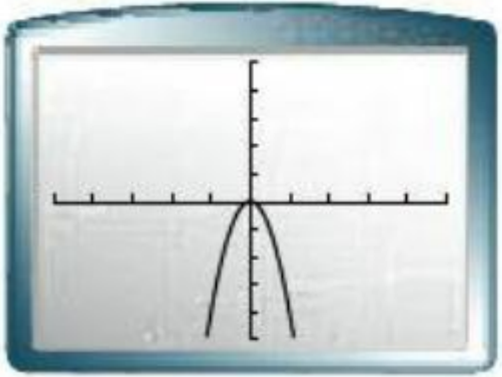
Comparing widths of parabolas

The coefficient of the x^2 - term in a quadratic function affects the width of a parabola as well as the direction in which it opens.

- Larger numbers stretch the graph so it gets closer together
- Fractions makes the graph wider.
- Negative sign flips the graph.

Use the graphs below. What is the order, from widest to narrowest, of the graphs of the quadratic functions $f(x) = -4x^2$, $f(x) = \frac{1}{4}x^2$, and $f(x) = x^2$?

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



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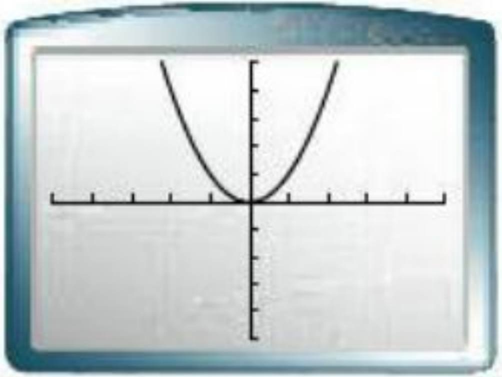
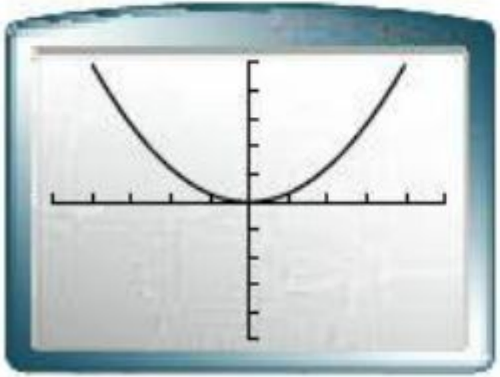


$f(x) = \frac{1}{4}x^2$

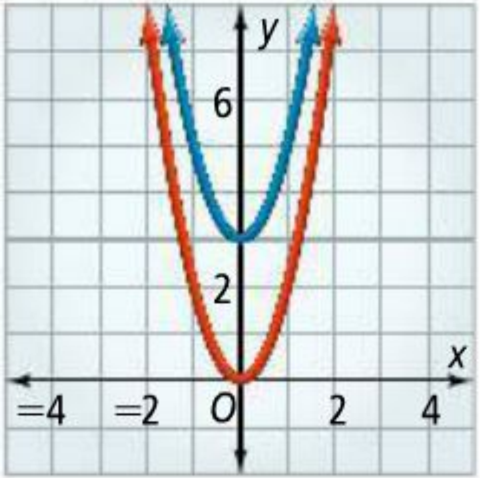


Graphing y = ax^2+c

The y-axis is the axis of symmetry for graphs of functions y = ax^2+c. The c translates the graph up or down.

How is the graph of $y = 2x^2 + 3$ different from the graph of $y = 2x^2$?

x	$y = 2x^2$	$y = 2x^2 + 3$
−2	8	11
−1	2	5
0	0	3
1	2	5
2	8	11



How do we use quadratics?

As an object falls, its speed continues to increase, so its height above the ground decreases at a faster and faster rate. Ignoring air resistance, you can model the object's height with the function $h = -16t^2 + c$. the height h is in feet, the time t is in seconds, and the object's initial height c is in feet.

How do we use quadratics?

Example 5: An acorn drops from a tree branch 20 ft. above the ground. The function $h = -16t^2 + 20$ gives the height h of the acorn (in feet) after t seconds. What is the graph of this quadratic function? At about what time does the acorn hit the ground?

Know

- The function for the acorn's height
- The initial height is 20 ft

Need

The function's graph and the time the acorn hits the ground

Plan

Use a table of values to graph the function. Use the graph to estimate when the acorn hits the ground.

t	$h = -16t^2 + 20$
0	20
0.5	16
1	4
1.5	−16

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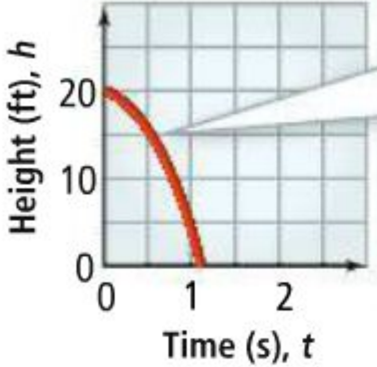

Graph the function using the first three ordered pairs from the table. Do not plot (1.5, −16) because height cannot be negative.

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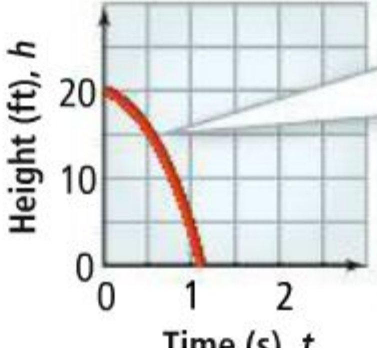

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The acorn hits the ground when its height above the ground is 0 ft. From the graph, you can see that the acorn hits the ground after slightly more than 1 s.

Practice

Suppose an acorn drops from a tree branch 70ft. above the ground. The function $h = -16t^2+70$ gives the height h of the acorn as it falls from the tree to the ground.

What is the graph of the function? About what time would the acorn hit the ground? What is a reasonable domain and range for the original function?

Practice

For a physics experiment, the class drops a golf ball off a bridge toward the pavement below. The bridge is 75 feet high. The function $h = -16t^2 + 75$ gives the golf ball's height h above the pavement (in feet) after t seconds. Graph the function. How many seconds does it take for the golf ball to hit the pavement?

Calculator Tools

1) Graph a quadratic
    a) Let's all graph $y = 3x^2 + 2x - 1$
2) Find the minimum!
    a) 2nd → Trace → minimum
    b) Left bound?
    c) Right bound?
    d) Guess?
3) Find the x-intercept
    a) 2nd → Trace → zero
    b) Left bound?
    c) Right bound?
    d) Guess?

Think About It!

How do you think you would find the maximum of a graph that opens downward?

What does "zero" mean?

Desmos

Sticky Note Wrap-Up

What are your lingering questions or points of confusion? Write them on a sticky note and post it on my back cabinet. We will address them on Monday.

No points of confusion? Try answering this challenge question: How might you use the maximum or minimum vertex in a real life situation? Write your answer on a sticky note and post it on the back of my door.

Homework

Textbook page 538 10 - 18 even, 26 - 30, 34 - 39, 48