

Warm-Up

Simplify (Get rid of the "i" in the denominator)

a)
$$\frac{2 + i}{1 - i}$$

b)
$$\frac{6 - 5i}{3i}$$

LT 4.2

Solving Quadratic Functions by using the Quadratic Formula and the Discriminant

LT 3.4-3.6

1. Solve quadratic equations.

$$f(x) = ax^2 + bx + c$$

BY

Graphing

Factoring

GCF

LT 4.2

1. Solve quadratic equations.

$$f(x) = ax^2 + bx + c$$

BY

Discriminant

&

Quadratic Formula
(Complex Numbers)

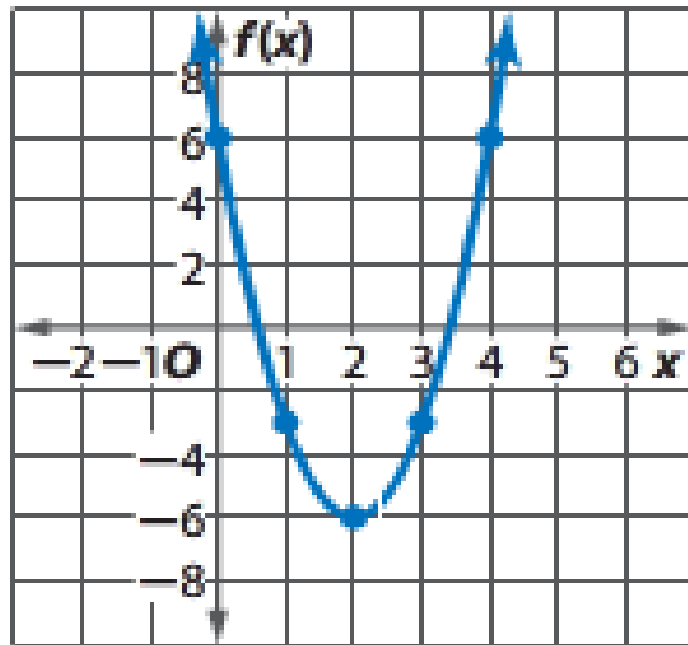
Quadratic Function

$$f(x) = ax^2 + bx + c, \text{ where } a \neq 0$$

quadratic term

linear term

constant term



Quadratic Formula

Key Concept Quadratic Formula

Words The solutions of a quadratic equation of the form $ax^2 + bx + c = 0$, where $a \neq 0$, are given by the following formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

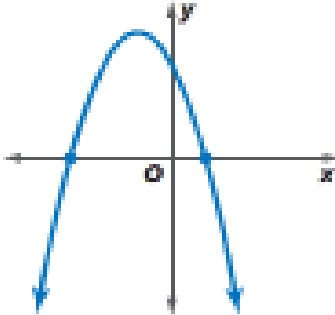
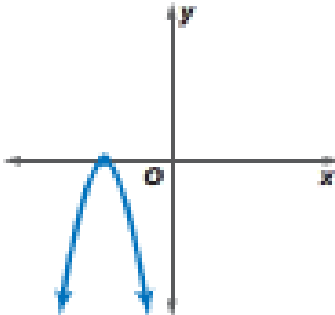
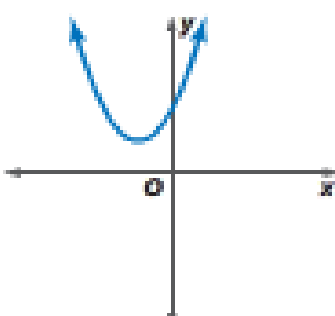
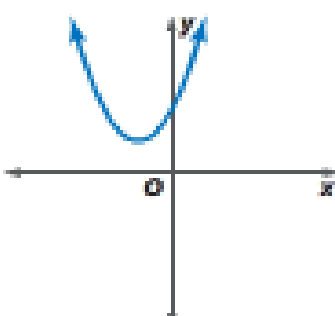
Example $x^2 + 5x + 6 = 0 \rightarrow x = \frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(1)}$

Discriminant

The Discriminant can be used to determine the number and types of roots of a quadratic equation.

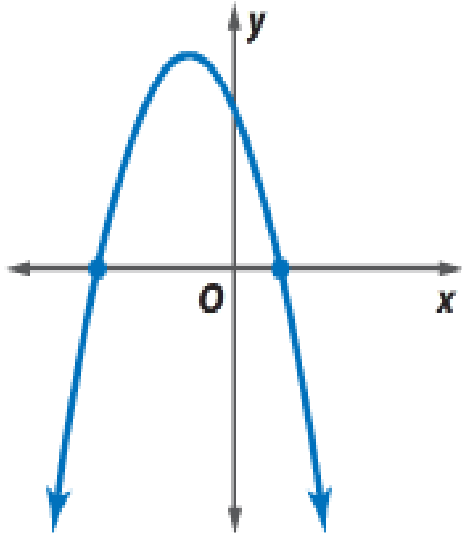
KeyConcept Discriminant

Consider $ax^2 + bx + c = 0$, where a , b , and c are rational numbers and $a \neq 0$.

Value of Discriminant	Type and Number of Roots	Example of Graph of Related Function
$b^2 - 4ac > 0$; $b^2 - 4ac$ is a perfect square.	2 real, rational roots	 A Cartesian coordinate system with x and y axes. A blue parabola opens downwards, intersecting the x-axis at two distinct points. The origin is labeled 'O'.
$b^2 - 4ac > 0$; $b^2 - 4ac$ is not a perfect square.	2 real, irrational roots	 A Cartesian coordinate system with x and y axes. A blue parabola opens downwards, intersecting the x-axis at two distinct points. The origin is labeled 'O'.
$b^2 - 4ac = 0$	1 real rational root	 A Cartesian coordinate system with x and y axes. A blue parabola opens downwards, with its vertex touching the x-axis at exactly one point. The origin is labeled 'O'.
$b^2 - 4ac < 0$	2 complex roots	 A Cartesian coordinate system with x and y axes. A blue parabola opens upwards, with its vertex above the x-axis, so it does not intersect the x-axis. The origin is labeled 'O'.

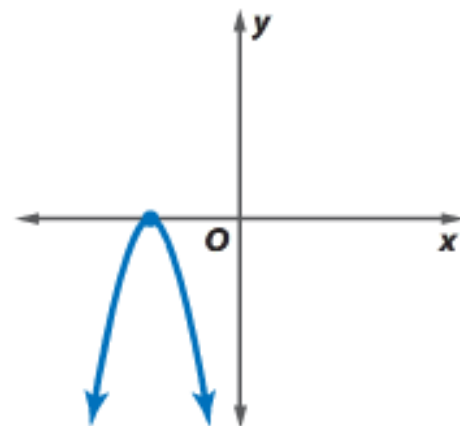
Key Concept Discriminant

Consider $ax^2 + bx + c = 0$, where a , b , and c are rational numbers and $a \neq 0$.

Value of Discriminant	Type and Number of Roots	Example of Graph of Related Function
$b^2 - 4ac > 0$; $b^2 - 4ac$ is a perfect square.	2 real, rational roots	 <p>The graph shows a blue parabola opening downwards on a Cartesian coordinate system. The x-axis and y-axis are shown, with the origin labeled 'O'. The parabola intersects the x-axis at two distinct points, representing two real roots. The roots are rational, as indicated by the text in the adjacent cell.</p>
$b^2 - 4ac > 0$; $b^2 - 4ac$ is <i>not</i> a perfect square.	2 real, irrational roots	

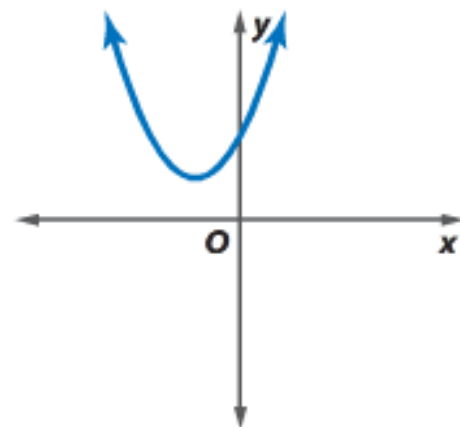
$$b^2 - 4ac = 0$$

1 real rational root



$$b^2 - 4ac < 0$$

2 complex roots



Example 1

$$x^2 - 10x - 11 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 2

$$2x^2 + 25x + 33 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 3

$$x^2 - 8x + 9 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 4

$$x^2 + 8x + 16 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 5

$$3x^2 + 5x + 1 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 6

$$x^2 - 6x + 10 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 7

$$3x^2 + 5x + 4 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 8

$$7x^2 - 11x + 5 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 9

$$-7x + 15x^2 - 4 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 10

$$x^2 + 6x - 16 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 11

$$3x^2 + 5x + 1 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Example 12

$$x^2 - 8x + 9 = 0$$

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

Review

Find the discriminant

Describe the number and types of root

Solve

Show the solution graphically.

$$x^2 - 10x - 11 = 0$$

$$x^2 + 6x - 16 = 0$$

$$2x^2 + 25x + 33 = 0$$

$$x^2 + 8x + 16 = 0$$