

# The Discriminant

Quadratic Equation - An equation of the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$  and  $c$  are real numbers and  $a \neq 0$ .

Discriminant - Determines the number and type of roots of a quadratic equation when  $a$ ,  $b$  and  $c$  are rational numbers.

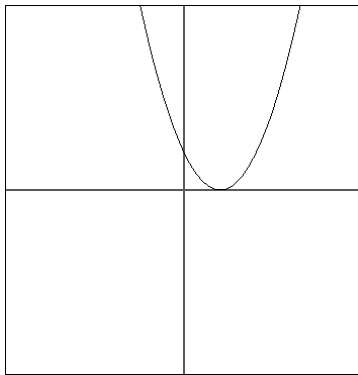
Quadratic Formula

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

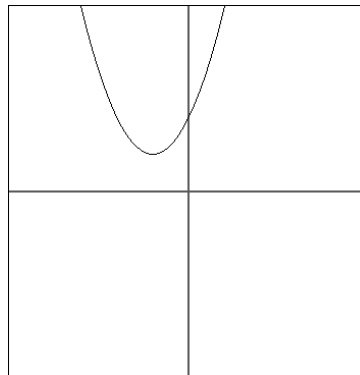
Discriminant

$$b^2 - 4ac$$

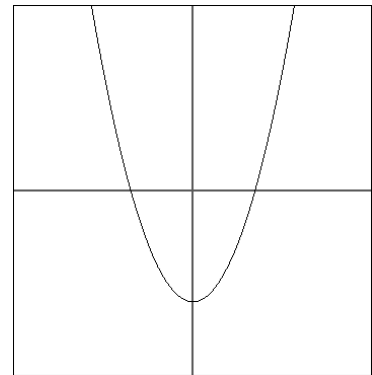
One Root



Zero Roots



Two Roots



Value of the Discriminant

Negative

Zero

Positive Perfect Square

Positive Non-Perfect Square

Number and Type of Roots

No Solution - Two Imaginary Roots

One Solution - One Real, Rational Root

Two Solutions - Two Real, Rational Roots

Two Solutions - Two Real, Irrational Roots

Directions: Use the discriminant to determine the number and type of solutions to the quadratic equation.

1.  $2x^2 + 6x + 3 = 0$

2.  $x^2 - 4x = -5$

3.  $x^2 - 2x - 3 = 0$

4.  $x^2 - 6x + 9 = 0$

5. If the roots of  $x^2 + bx + 16 = 0$  are equal, then what is the value of  $b$ ?

6. If the roots of  $ax^2 + 6x + 4 = 0$  are imaginary, then what is the least integral value of  $a$ ?

7. Find the largest integral value for  $k$  for which the roots of  $2x^2 + 7x + k = 0$  are real?