

4.4 The Quadratic Formula

The Quadratic Formula is a formula used for determining the roots of a quadratic equation of the form

$$ax^2 + bx + c = 0$$

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

Ex. Solve each of the following equations.

a) $2x^2 + x - 3 = 0$

b) $x^2 - 4x - 3 = 0$

Turn over

c) $4x^2 + 12x + 9 = 0$

d) $x^2 - 4x + 5 = 0$

Turn Over

Example 2

Use the Quadratic Formula to Solve Quadratic Equations

Use the quadratic formula to solve each quadratic equation.
Express your answers to the nearest hundredth.

- a) $9x^2 + 12x = -4$
- b) $5x^2 - 7x - 1 = 0$

Example 3

Select a Strategy to Solve a Quadratic Equation

- a) Solve $6x^2 - 14x + 8 = 0$ by
 - i) graphing the corresponding function
 - ii) factoring the equation
 - iii) completing the square
 - iv) using the quadratic formula
- b) Which strategy do you prefer? Justify your reasoning.

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Ex. Determine the exact roots of $x^2 + \frac{x}{3} - \frac{1}{2} = 0$

Ex. Solve $2x^2 - 4x + 9 = 0$

Assign p. 254 - 256 #'s 3(ace), 4(ac), 5(bcd), 6, 7(ade), 21, 22

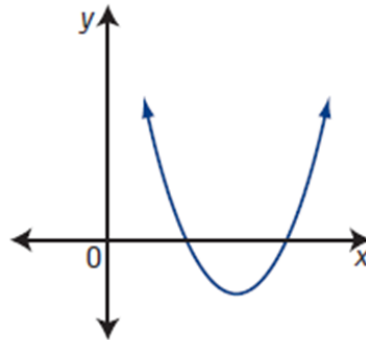
Discriminant is

- the expression $b^2 - 4ac$ located under the radical sign of the quadratic formula
- you can use its value to determine the nature of the roots for a quadratic equation

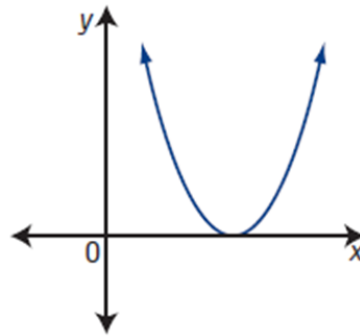
$$ax^2 + bx + c = 0, a \neq 0$$

There are three cases for discriminant:

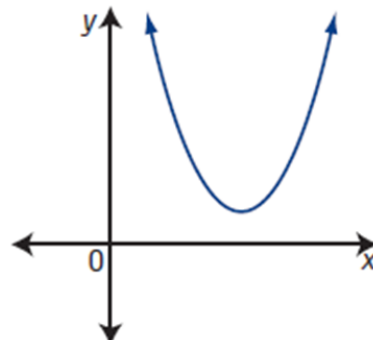
$$b^2 - 4ac > 0$$



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



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



Example 1

Use the Discriminant to Determine the Nature of the Roots

Use the discriminant to determine the nature of the roots for each quadratic equation. Check by graphing.

a) $-2x^2 + 3x + 8 = 0$

b) $3x^2 - 5x = -9$

c) $\frac{1}{4}x^2 - 3x + 9 = 0$

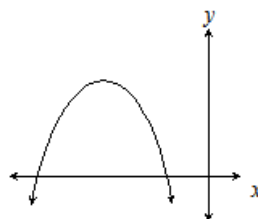
Ex 2. Find the values of the equation $x^2 + kx + 9 = 0$
for which it has two equal roots.

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Ex 3. For what values of t does $x^2 + tx + t + 3 = 0$ have one real root?

Ex 4. The graph of a quadratic function $f(x)$ is shown. What best describes the discriminant for $f(x) = 0$?

- (A) $D < 0$
- (B) $D = 0$
- (C) $D \geq 0$
- (D) $D > 0$



Ex 5. A quadratic function has a vertex of $(4, -5)$ and opens up. What is the nature of the roots?

- (A) imaginary and equal
- (B) imaginary and unequal
- (C) real and equal
- (D) real and unequal

Ex 6. What is the value of the discriminant for $2x^2 + \sqrt{10}x - 1 = 0$?

- (A) $\sqrt{2}$ (B) 2 (C) $\sqrt{18}$ (D) 18

Key Ideas p. 253

Assign p. 254 #'s 1(ace),2(ace)