Sec 5-8: The Quadratic Formula

Equation must be written in the following form:

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

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

| Discriminant | # and kind of solutions |
|---|---|
| $b^2 - 4ac > 0$ | 2 Real Solutions |
| $b^2 - 4ac = 0$ | 1 Real Solution |
| $b^2 - 4ac < 0$ | 0 Real Solutions or 2 Imaginary Solutions |

A Quadratic Equation always has two real solutions if:

$b^2 - 4ac$ is positive

$b^2 - 4ac$ will ALWAYS be positive if:

Either a OR c is negative.

How many x-intercepts does each Quadratic Function have?

This is the same as asking how many solutions or how many zeros does it have

1. $y = 4x^2 - 6x + 3$

$b^2 - 4ac = 36 - 4(4)(3)$

$36 - 48 = -12$

No Real Solution means
No x-intercepts

2. $y = -3x^2 + 15x + 19$

Since a is negative and c is positive there will be Two Real Solutions.

Therefore, there are Two x-intercepts

## Find the EXACT Solutions.

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

$x^2 + 3 = 5x$

rewrite into Standard Form first

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

$b^2 - 4ac =$ 13 2 Real Solutions

$x = \dfrac{5 \pm \sqrt{13}}{2}$

since you can't simplify the square root there is nothing left to do.

## Find the EXACT Solutions.

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

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

$b^2 - 4ac =$ 72 2 Real Solutions

$x = \dfrac{8 \pm \sqrt{72}}{2} \Rightarrow \sqrt{36 \cdot 2} = \dfrac{8 \pm 6\sqrt{2}}{2}$

Divide 8 and 6 by 2.

$4 \pm 3\sqrt{2}$

## Find the EXACT Solutions.

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

$4x^2 - 24x + 31 = 0$

$b^2 - 4ac =$ 80 2 Real Solutions

$x = \dfrac{24 \pm \sqrt{80}} = \sqrt{16 \cdot 5}$

$8$

$x = \dfrac{24 \pm 4\sqrt{5}}{8} = \dfrac{6 \pm \sqrt{5}}{2}$

reduce using the GCF of 4

## Find the EXACT Solutions.

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

$4x^2 - 12x + 9 = 0$

$b^2 - 4ac =$ 0 One Real Solution

$x = \dfrac{-b \pm \sqrt{0}}{2a} = \dfrac{-b}{2a} = \dfrac{12}{8} = \dfrac{3}{2}$