The Quadratic Formula

Using the q**uadratic formula, we** can solve all quadratic equations.

If $ax^2 + bx + c = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Solve the equations $6x - 1 = x^2$

First we put the equation in **standard form** by subtracting x^2 from each side.

$-x^2 + 6x - 1 = 0$

We will use the quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$**, where** $a = -1$, $b = 6$, $c = -1$**.**

$\dfrac{-6 \pm \sqrt{(6)^2 - (4)(-1)(-1)}}{-2(-1)}$ Substitute $a = -1$, $b = 6$, $c = -1$ into the formula. Place the parentheses on the numbers to avoid making mistakes on "signs"

$\dfrac{-6 + \sqrt{36 - 4}}{-2}$ Simplify.

$\dfrac{-6 + \sqrt{32}}{-2}$ Simplify the radical part, using the fact that $32 = 16 \cdot 2 = 4\sqrt{2}$.

$\dfrac{-6 + 4\sqrt{2}}{-2}$ or $\dfrac{-6}{-2} \pm \dfrac{4\sqrt{2}}{-2}$ Factor the numerator (the numerator). -2 is a factor of both terms in

$\dfrac{-2(3 \pm 2\sqrt{2})}{-2}$ Cancel the common factor of -2 from the numerator and denominator.

$3 \pm 2\sqrt{2}$ There are two distinct solutions.

$3 + 2\sqrt{2}$ and $3 - 2\sqrt{2}$

Note: the fact that $b^2 - 4ac$ is not equal to a perfect square indicates that it is not possible to solve this equation by factoring.

Exercises: Solve the equations using quadratic formula.

1. $x^2 + 24x - 0 = 2$ **2.** $2x(x - 3) = 2$ **3.** $\frac{1}{2}x^2 + \frac{3}{2}x - 0 = 2$ **4.** $7x^2 + 4 = 2x$

Answers:

1. $\{4,-6\}$ **2.** $\frac{3 \pm \sqrt{13}}{2}$ **3.** $\{-4,1\}$ **4.** $\frac{1 \pm 3\sqrt{3}i}{7}$