Methods of Solving Quadratic Equations

Standard Form: \( ax^2 + bx + c = 0 \) \( (a \neq 0) \)

1. Square Root Method
   - If the equation is in the form \( (ax + c)^2 = d \), then the square root method may be the easiest method.

2. Factoring
   - If \( b^2 - 4ac \) (the discriminant) is a perfect square, then you can solve by factoring.

3. Completing the Square
   - If the equation is in the form \( x^2 + (\text{even number})x + \text{constant} = 0 \), then completing the square may be the easiest method. (It can be used for any quadratic equation, though.)

4. The Quadratic Formula
   - The quadratic formula can be used to solve ANY quadratic equation.

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

In this section, we’re going to discuss equations that involve quadratic equations, even if they don’t look like it at first glance!

Fractions/Rational Expressions: when solving an equation involving fractions or rational expressions, it is sometimes easier to “clear” the fractions by multiplying both sides of the equation by the ______________

Example 1: Solve \( \frac{11}{2x^2 + x - 15} = \frac{5}{2x - 5} - \frac{x}{x + 3} \).
**More on Factoring:** to find ALL solutions in the complex number system for equations that involve polynomials of degrees higher than 2, we must solve by factoring (Note that there are formulas for polynomials of degrees 3 and 4, but not for degree 5 or higher.)

*Example 2:* Solve $z^4 = 81$.

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**Substitution:** some equations are reducible to quadratic when we use substitution with a variable

*Example 3:* Solve $x^3 - 2x^3 - 8 = 0$.

*Example 4:* Solve $y^{-1} - 12y^{-\frac{1}{2}} + 20 = 0$. 