9.3 Equations Quadratic In Form

OBJECTIVES

- Solve an equation with fractions by writing it in quadratic form.
- Solve an equation with radicals by writing it in quadratic form.
- Solve an equation that is quadratic in form by substitution.

Otherwise known as:

4 Methods of Solving Quadratic Equations

- **Factoring**

Advantages	Disadvantages
This is usually the fastest method.	Not all polynomials are factorable. Some polynomials that can be factored are difficult to factor.

- **Square Root Property**

Advantages	Disadvantages
This is the simplest method for solving equations of the form $(ax + b)^2 = c$.	Few equations are given in this form.

4 Methods of Solving Quadratic Equations

- **Completing the Square**

Advantages	Disadvantages
This method can always be used, although most people prefer the quadratic formula.	It requires more steps than other methods.

- **Quadratic Formula**

Advantages	Disadvantages
This method can always be used. (And you get to sing!!)	It is more difficult than factoring because of the square root, although calculators can simplify its use.

Equations with Fractions that lead to Quadratic Equations

Solve:

$$\frac{1}{x} + \frac{1}{x-1} = \frac{7}{12}$$

$$7x^2 - 31x + 12 = 0$$

Solve:

$$\frac{4}{x-1} + 9 = -\frac{7}{x}$$

Radical Equations that lead to Quadratic Equations

Solve:

$$x = \sqrt{6x - 8}$$

Solve.

$$x + \sqrt{x} = 6$$

"Super Size" Quadratic Equations

$$x^4 - 13x^2 + 36 = 0$$

This is "quadratic in form" because the middle variable squared is the same as the first variable.

"SUPER SIZE" Quadratic Equations

- Other equations "quadratic in form":

  - $5x^6 + 2x^3 - 7$
  - $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$
  - $(x+3)^2 + (x+3) + 6 = 0$

"SUPER SIZE" Quadratic Equations

- The way to solve a super size quadratic equation is to make what is called a $\boldsymbol{u}$ substitution. (It can be any letter but $\boldsymbol{x}$)

- Let's see how it works by looking at an example!

$$x^4 - 13x^2 + 36 = 0$$

- Solve.

$$x^4 - 13x^2 + 36 = 0$$

- Solve.

$$5x^6 + 2x^3 - 7 = 0$$

- Solve.

$$x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$$

- Solve.

$$(x+3)^2 + 5(x+3) + 6 = 0$$