

Math 1300
Section 4.4
Solving Equations by Factoring

Definition: The zero-product property says that if a and b are numbers and if $ab = 0$, then $a = 0$ or $b = 0$ (or both).

Definition: A quadratic equation is an equation that can be written $ax^2 + bx + c = 0$, where a , b , and c are numbers and $a \neq 0$.

Solving Quadratic Equations

To solve a quadratic equation, we must find all possible values for x that make

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

Factoring is usually a helpful way to solve quadratic equations.

To use factoring, move all nonzero terms to one side of the equal sign so that the other side is zero. Then use the zero-product property.

Examples:

1. Solve the equation: $x^2 - 5x - 24 = 0$

2. Solve $2x^2 + 18x - 72 = 0$ for x .

3. $6x^2 - 27x = -12$

4. $16x^2 = 1$

5. $-12x^2 = -17 + 6$

6. $x(x - 2) = -1$

7. $9x^2 - 4 = 0$

8. $x^2 + 16 = 0$

Solving Other Polynomial Equations

Solving other polynomial equations is done just like the quadratic equations: Set one side of the equation to zero, factor, use the zero-product property, and solve for x .

9. $4x^3 + 16x^2 + 15x = 0$

10. $x^3 = 2x^2 + 99$

11. $7x^3 - 14x^2 = 0$

12. $x^3 + 18 = 2x^2 + 9x$

13. $30x^3 - 3x^2 - 9x = 0$

14. $2(x - 1)^2 = 2x(x^2 - 20) + (8x^2 + 2)$

How to solve an equation:

- 1) Factor the expression.
- 2) Set each factor equal to 0.
- 3) Solve each simpler equation.

Solve each equation by factoring.

1. $x^2 - 49 = 0$

2. $9x^2 - 64 = 0$

3. $x^2 - 4x = 0$

4. $2x^2 - 5x + 3 = 0$

5. $3x^2 + 10x = 8$

6. $-24x^2 - 72x - 48 = 0$

7. $x^3 - 2x^2 - 4x + 8 = 0$

8. $6x^2 + 13x - 15 = 0$

9. $16x^3 = 25x$

10. $30x^3 - 3x^2 - 9x = 0$

11. $x^4 + 3x^2 - 4 = 0$

12. $4x^3 - 52x^2 - 3x + 39 = 0$