



Math122 College Algebra

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Ch1.1

Equations

- Equations are a mathematical tool for solving problems in the real-world
- An equation such as $2 + 4 = 6$ states that two mathematical expressions are equal
- Equations of interest contain variables such as $3x + 2 = 11$
- x is an unknown in the above equation
- solutions (or roots) are values that make the equation true
- solving an equation is the process of finding the solutions of the equation

Equations

- Equivalent equations are two equations with the same solutions
- Solving an equation is the process of finding equivalent equations where the variable is isolated on one side of the equal sign
- Solve $3x + 2 = 11$
Answer $3x + 2 = 11 \Leftrightarrow 3x = 9 \Leftrightarrow x = 3$
- \Leftrightarrow means equivalent to

Properties of Equality

1. $A = B \Leftrightarrow A + C = B + C$ means we can produce an equivalent equation by adding the same value to both sides of an equation
2. $A = B \Leftrightarrow AC = BC$ ($C \neq 0$) means we can produce an equivalent equation by multiplying the same non-zero value to both sides of an equation

Linear Equations

- A linear equation in one variable is of the form $ax + b = 0$ where
 1. a and b are real numbers
 2. x is the variable

Problem

- Place an L by a linear equation and a N by a nonlinear equation for each equation below

1. $2x + 3 = 0$

2. $y^2 + y = 1$

3. $2a = \frac{1}{2}a + 5$

4. $\frac{3}{x} = 1$

5. $\sqrt{y} - 2y = 0$

Problem

- Solve the following equations for x and check your results.

1. $4x - 3 = 2x - 6$

2. $\frac{-2x}{3} = -12$

3. $\frac{5x-20}{3x} = \frac{5}{9}$

Equation with no Solution

- Solve the following equation for y and check your results.

1. $2 + \frac{5}{x-4} = \frac{x+1}{x-4}$

Solving Power Equations

- Linear equations have variables only to the first power
- What about equations that involve squares, cubes, ...
- Example $2y^2 - 4 = 0$

Solving Power Equations

- The power equation $X^n = a$ has the solution
$$X = \sqrt[n]{a} \text{ if } n \text{ is odd}$$
$$X = \pm \sqrt[n]{a} \text{ if } n \text{ is even and } a \geq 0$$
- Note: If n is even and $a < 0$, the equation has no real roots

Problem

- Solve each of the following equations.

1. $y^3 = 27$

2. $a^2 = 4$

3. $x^2 = -4$

Problem

- Solve each of the following equations and check your answer.

1. $y^2 - 3 = 0$

2. $(y - 3)^2 = 3$

3. $(y + 3)^2 = -3$

Problem

- Solve each of the following equations and check your answer.

1. $y^3 = -27$

2. $16a^4 = 81$

3. Solve $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ for R_1