Math 1111 – Linear Equations and Rational Equations

Objectives:

1. Solve equations in one variable

2. Solve equations containing fractions

3. Specify excluded values from the domain

4. Solve rational equations with a variable in the denominator

When the highest exponent on a variable is a 1, then this is called a linear equation in one variable.

A linear equation in one variable can be written, where *a* and *b* are real numbers and *a* ≠ 0, as

*a*x + *b* = 0

**Objective 1:** Solve equations in one variable.

To solve a linear equation in one variable:

1. Simplify each side of the equation as much as possible.

Use the Distributive Property to remove any parentheses.

Combine like terms.

2. Collect all variable terms on one side of the equation.

Use the Addition or Subtraction Property of Equality.

3. Collect constant terms on the other side of the equation.

Use the Addition or Subtraction Property of Equality.

4. Make the coefficient of the variable term equal to 1.

Use the Multiplication or Division Property of Equality.

5. Check the solution.

Substitute the solution into the original equation to make sure the result is a true statement.

Example #1: Solve each equation.

A. 8x + 4 = 20

B. 7(n – 3) – 8 = -15

C. (6u + 3) = 7 – u

D. 4 (x – 1) – 2 = 5(2x + 3) + 6

**Objective 2:** Solve linear equations involving fractions.

To solve a linear equation involving fractions:

1. Clear the fractions by multiplying by the LCD. (See Rational Expressions Notes)

2. Solve the equation like in Objective 1 above.

Example #2: Solve each equation by clearing the fractions.

A. 5 =

B.

C.

D.

**Objective 3:** Specify excluded values from the domain.

When you are solving a rational equation with variables in the denominator, we need to be sure that the answer does not include a number that will make the denominator zero. This is considered an undefined answer. We do not need to exclude any numbers from the numerator.

To determine which numbers, need to be excluded from the domain:

1. Factor the denominator, if needed.

2. Set the denominator equal to zero.

3. Solve the equation. These are the values that need to be excluded from the denominator.

Example #3: Determine the excluded values.

A.

B.

C.

**Objective 4:** Solve rational equations with variables in the denominator.

To solve a rational equation:

1. Factor all denominators in the equation, if applicable. (See Rational Equations Notes)

2. Find and exclude values that set each denominator equal to zero.

3. Find the LCD.

4. Clear the fraction by multiplying the whole equation by the LCD

5. Solve the remaining equation as in Objective 1 above.

6. Check your answer. If the answer is the excluded value, then there is no solution.

Example #4: Determine any excluded values then solve each equation by clearing the fractions.

A.

B.

C.

D.

E.

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