MAT 171 (Illenye) - Notes

Section 1.2 Linear Equations and Rational Equations

Definitions:

1: Linear Equation in one variable

Any equation that can be written in the form of $ax + b = 0$

2: Rational Equation

Any equation that contains one or more rational expressions.

$$\frac{1}{x} = 12 + \frac{x}{3}$$

*** Review Least Common Denominator(LCD) ***

3: Generating Equivalent Equations

1. Simplify an expression by removing grouping and combining like terms.

$$5(2x + 4) = 3x - x \iff 10x + 20 = 2x$$

2. Add (or subtract) the same real number or variable expression on both sides of the equation.

$$10x + 20 = 2x \iff 10x + 20 - 10x = 2x - 10x \iff 20 = -8x$$

3. Multiply (or divide) by the same *non-zero* quantity on both sides of the equation.

$$20 = -8x \iff \frac{20}{-8} = \frac{-8x}{-8} \iff \frac{20}{-8} = x \iff -\frac{5}{2} = x$$

Know difference between an algebraic expression and an algebraic equation.

Algebraic Expressions do not have an equal sign. Do not add one. **Example:** $4(x - 1) + 6x$ These type of expression can be simplified but not solved.

Algebraic Equations have an equal sign. **Example:** $3x + 12 = 6$

Conditional Equation has at least one real number solution but is not an identity equation. **Example:** $3x + 12 = 6$

Identity Equations are true for all values of x. **Example:** $3x + 12 = 3(x + 2) + 6$

Inconsistent Equations have no real number solutions. **Example:** $3x + 12 = 3x$

Examples

1) $7x + 2 = 23$

2) $2(x - 1) + 3 = x - 3(x + 1)$

3) $\frac{x}{5} - \frac{x}{2} = 3 + \frac{3x}{10}$

4) $\frac{2y}{3} + \frac{y-3}{2} = \frac{y+1}{4}$

5) $\frac{5}{2x} - \frac{8}{9} = \frac{1}{18} - \frac{1}{3x}$

6) $\frac{7}{2x+1} - \frac{8x}{2x-1} = -4$

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