Solving Linear Equations Video Lecture

Sections 2.2 and 2.3

Course Learning Objective:

Solve linear equations.

Weekly Learning Objectives:

1) **Define linear equations.**
2) **Use both the addition and multiplication properties of equality to solve linear equations.**
3) **Apply a general strategy for solving linear equations.**
4) **Solve equations containing fractions.**
5) **Solve equations containing decimals.**
6) **Recognize identities and equations with no solution.**

Solving Linear Equations

A linear equation can be written in the form $ax + b = c$, where a doesn't equal 0.

Non-linear equations are more difficult to solve and would contain terms like:

When solving a linear equation there are 3 cases that could occur:

1 solution => Conditional Equation

Example: $x + 3 = 5$ is only true when $x = 2$

No Solution => Contradiction

Example: $x + 2 = x$ is always false, so answer would be No Solution or $\emptyset$

Infinite Solutions => Identity

Example: $2 + x = x + 2$ is always true, so answer would be x = all real numbers

Identity	Conditional	Contradiction
Always True	True for only some values of x	Always False
Solution: all real #'s	Solution: x = #	Solution: No Solution or $\emptyset$

Goal of solving linear equations is to isolate x by itself and get x = #

1) Clear fractions, decimals and groupings AND combine like terms

CLEAR FRACTIONS OR DECIMALS BY MULTIPLYING EACH TERM ON BOTH SIDES BY THE LCD.
CLEAR GROUPINGS BY USING THE DISTRIBUTIVE PROPERTY

2) Get variable terms together on one side of the equation, constants on the other side:

ADD/SUBTRACT THE SAME VARIABLE TERM TO BOTH SIDES OF THE EQUATION.
and/or
ADD/SUBTRACT THE SAME NUMBER TO BOTH SIDES OF THE EQUATION.

3) Make the coefficient of the variable term a "one".

DIVIDE BOTH SIDES OF THE EQUATION BY THE COEFFICIENT OF THE VARIABLE IF IT ISN'T ALREADY A "ONE".

****AT THIS POINT YOU SHOULD BE FINISHED. BE SURE THAT THE ANSWER IS IN SIMPLEST FORM. CHECKING YOUR SOLUTION IS OPTIONAL.**

Ex: $4x - 3 - 8x + 1 = -5x + 9$

Ex: (8r - 3) - (7r + 1) = -6

Ex: 9(2m - 3) - 4(5 + 3m) = 5(4 + m) - 3

Ex: 6x - 4(x + 2) - 2x = 0

Ex: 3(6 - 4x) = 2(-6x + 9)

Note: If the solution is an identity or contradiction then your variables will always cancel out and disappear when solving. You will be left with either a:

True Statement
(like 0 = 0)
Solution: All real #'s

False Statement
(like 0 = 1)
Solution: No Solution

Examples:

$$\frac{1}{5}x - 7 = \frac{-4}{5}x + 7x$$

$$\frac{2}{3}x - \frac{3}{4} = \frac{3}{8} - \frac{1}{9}x + \frac{1}{6}$$

$$\frac{x+3}{5} - \frac{x-3}{4} = 1$$

$$\frac{2m-3}{3} - \frac{4m-2}{6} = 3$$

$$-.4x + 2.7 - 1.6x = -4.6x + 2.7$$

$$.02(5000) + .03p = .025(5000 + p)$$

$$-\frac{5}{6}q - \left(q - \frac{1}{2}\right) = \frac{1}{4}(q + 1)$$