Lesson 4 – Linear Equations & Inequalities

Math 2 Honors -Santowski

Fast Five

- What does it mean to **SOLVE**??
- EXPLAIN to your table partners, 3 different ways that you can **SOLVE** the equation:

$$6x^3 - \frac{2}{x^4} - e^{x^2} = \frac{1}{x - x^2}$$

- EXPLAIN how you would then **SOLVE**

$$6x^3 - \frac{2}{x^4} - e^{x^2} \le \frac{1}{x - x^2}$$

Fast Five

- If the reciprocal of $\frac{1}{x} - 1$ is -2, determine the value of x
- What is the value of $p + q$ if $\frac{p}{q} = -1$

Lesson Objectives

- Write and solve linear equations in one variable
- Become familiar with different representations that can be used to solve equations
- Understand what it means to have a unique, no, or infinite solutions
- Write, solve, and graph linear inequalities in one variable

BIG Picture

- Since we have defined Math as a study of numbers, we also note that part of our definition of math focuses on the INTERRELATIONSHIPS that exist with our numbers.
- One constant theme in our course will be studying various ways that numbers are INTERRELATED and the first model used to study these interrelationships will be LINEAR MODELS.
- So if Linear Models can be used to study the interrelationships between numbers, **HOW** do we work with these models **ALGEBRAICALLY**??

(A) Solving One Variable Linear Equations

- Linear equations can be solved in 3 ways:
  - (i) algebraic methods
  - (ii) graphic methods
  - (iii) numeric methods
- We will review some key ideas/steps in solving various equations

(A) Solving Linear Equations - Algebraically

- Solve and verify:

$$-3(4x+3)+4(6x+1)=43$$

$$\frac{5}{r+3}=\frac{8}{r+4}$$

(A) Solving Linear Equations - Graphically

- Now let's use the graphing calculator and the graphing option to solve the same equations ➔ what do we look for and why?

$$-3(4x+3)+4(6x+1)=43$$

$$\frac{5}{r+3}=\frac{8}{r+4}$$

(A) Solving Linear Equations - Numerically

- Now let's use the graphing calculator to solve the same equations ➔ BUT your graphing view screen DOES not work ➔ how would you use a table of values and why?

$$-3(4x+3)+4(6x+1)=43$$

$$\frac{5}{r+3}=\frac{8}{r+4}$$

(A) Solving Linear Equations

- Is it possible for an equation to have NO solution? What does this MEAN in terms of the original equation?
- (let's say we limit ourselves to real numbers in our discussion)
- Write your own example of an equation that has no solution

(A) Solving Linear Equations

- Is it possible for an equation to have INFINITE solution? What does this MEAN in terms of the original equation?
- (let's say we limit ourselves to real numbers in our discussion)
- Write your own example of an equation that has INFINITE solutions

(A) Solving Linear Equations

- Under what conditions for the parameter ***a*** will the following equation have NO solution?

$$3(ax-5)=6x-2$$

- What is the graphic significance of this non-solution?
- Would your answer for the value of ***a*** change if the equation now is

$$3a(x-5)=6x-2$$

(A) Solving Linear Equations

- Under what conditions for the parameter ***a*** and ***b*** will the solution set be infinite? What is the graphical significance of an infinite solution set?

$$3(ax-5)=6x-b$$

(A) Solving Literal Equations

- Solve the following equations for the given variable:

(a) $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ for c

(b) $A=\dfrac{h(b_1+b_2)}{2}$ for b_2

(c) $I=P(1+rt)$ for r

(d) $y=\dfrac{u+1}{u+2}$ for u

(B) Solving Inequalities - Algebraically

- Solve the following one variable linear inequalities algebraically. Express your solution set in set notation, in interval notation, and using a number line. EXPLAIN how to verify your solution

$-5(1-5x)+5(-8x-2)\le -4x-8x$

$x+4<16$ and $x-3>12$
$x+8<5$ or $x-1>3$

$\dfrac{x-3}{x}<\dfrac{9}{10}$ but their is one MAJOR consideration here.... WHY??

(B) Solving Inequalities - Algebraically

- Example: Solve algebraically and verify algebraically as well as graphically:
- -3 < 2x + 5 < 7

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This can be written as a compound inequality by writing

-3 < 2x + 5 **and** 2x + 5 < 7

-8 < 2x **and** 2x < 2 Subtracting 5

-4 < x **and** x < 1 Dividing by 2

(B) Solving Inequalities - Algebraically

- Solve the following compound inequalities:

- -5 ≤ 3x + 4 < 19
- 2y - 1 < y + 2 < 6y + 1
- 15 - t ≤ t + 15 < 9t - 9
- h + 1 ≤ 2/3 h ≤ h - 2

(B) Solving Inequalities - Graphically

- Solve the following one variable linear inequalities graphically. Express your solution set in set notation, in interval notation, and using a number line. EXPLAIN how to verify your solution

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Homework

- p. 49 # 31-39, 47-53 odds, 63
- p. 58 # 47,49,51,57,59,61

- Sullivan Text for Word Problems; p134, Q106,107,109,110,111 (make a reasonable effort!!!!)