

MTH 30 LECTURE NOTES (Ojakian)

Topic 6: Solving Inequalities

OUTLINE

References: 1.6

1. Inequality terminology
 - (a) Basic terminology
 - (b) Solution set
 - (c) Graphing inequalities
 2. Solving Linear Inequalities
 3. Bringing in Absolute Value
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1. Reminders on Equations

(a)

Definition 1. *Given an equation, a **solution** is a single number that makes it true. The **solution set** is the set of numbers that make it true. To **solve** an equation means to find the solution set.*

PROBLEM 1. *For each equation, find its solution set. Then determine which are “identities” and which are not*

i. $x + 5 = 15$

ii. $x + 2x = 3x$

iii. $y + y = y$

iv. $x = x + 1$

v. $x^2 = 25$

(b) Tools for Solving:

i. Simplifying

ii. Doing the same thing to both sides

(c) Examples of linear equations

PROBLEM 2. *Solve each equation, writing a justification for each new line in your solution.*

i. $13x + 7 - 10x = -2 - 3$

ii. $4x - 6 = 7x - 3$

iii. $2(3 - 2x) = 2 - (3x - 4)$

2. Meaning of inequality signs

PROBLEM 3. For each statement, is it true or false?

(a) $5 < 6.3$

(b) $0 > \frac{91}{13}$

(c) $-43 > -100$

(d) $5 = 5.03$

(e) $3 \leq 7$

(f) $3 < 3$

(g) $3 \leq 3$

(h) $-\frac{3}{4} \geq -10$

3. Solution set

Definition 2. Given an inequality (with a variable), a **solution** is a single number that makes it true. The **solution set** is the set of numbers that make it true. To **solve** an inequality means to find the solution set.

PROBLEM 4. For each inequality, find three different numbers in its solution set. Then solve it. Then graph the solution on the number line.

(a) $x > -5$

(b) $x \geq -5$

(c) $u \leq 2u$

4. Solving Inequalities

(a) Principle: Use all the usual rules (for equations), **except for the exceptions ...**

PROBLEM 5. For each inequality graph its solution set.

i. $x \geq 5$

ii. $2x \geq 10$

iii. $-2x \geq -10$

iv. $-2x \leq -10$

(b) Principle for solving inequalities: Use all the usual rules (for equations), **except** that when you multiply or divide by a negative number **reverse the inequality**.

(c)

PROBLEM 6. Solve each inequality

i. $\frac{x}{-3} > 6$

ii. $2(x - 7) < -6$

iii. $8y + 3(y - 12) > 7y - 28$

5. Solving Equations with Absolute Value

(a) Strategy:

- i. Isolate absolute value
- ii. Set inside absolute value to positive and negative of other side
- iii. Check that solutions do not make absolute value = negative!

(b) Problems

- i. $|x| = 7$
- ii. $|x| = -7$
- iii. $|5x + 2| - 4 = 9$

6. Solving Inequalities with Absolute Value

(a) Strategy:

- i. Isolate absolute value (so positive number on other side)
- ii. Cases on $>$ versus $<$
- iii. Solve

(b) Problems

Textbook Section 1.6, exercises: 31, 29, 30

Problem: $-\frac{1}{2}|4x - 5| < -3$