## Lecture L.1, L.2

## L.1, L.2 <u>Linear Equations in One Variable and Formulas</u>

**expression** – sequence of numbers, variables, operation symbols and grouping symbols **equation** – two expressions connected by an equal sign

equations can be solved, while expressions can only be simplified or evaluated

ex.

 $\frac{1}{2}(2x+6) = 0$ equation to solve

 $\frac{1}{2}(2x+6)$ expression to simplify or evaluate

**linear equation in one variable** - an equation that can involve a variable but only in the first power; such equation can be rewritten in the following, equivalent form Ax + B = 0

ex. 
$$2x - 7 = 3$$
  $5x - 1 = 5x + 4$   $1 = 1$ 

ex. of nonlinear equations:  $\frac{8}{x} = 5$   $\sqrt{x} + 3 = 7$   $x^2 + 3x = -2$ 

**solution** - a value of the variable that will make the equation true **solution set** - a set of all possible solutions

*Example 1:* Find the solution set for the following equations: a) 2x - 7 = 3 b) 5x - 1 = 5x + 4 c) 1 = 1

If a linear equation has a) one solution, it is called a **conditional** equation b) infinitely many solutions (all real numbers), it is an **identity** c) no solutions, it is a **contradiction** 

equivalent equations – equations with the same solution sets

We can produce equivalent equations by

- adding to both sides of the equation the same value,
- multiplying both sides of the equation by the same, nonzero value

Practice:

1. Solve.

a) 
$$4[2x - (3 - x) + 5] = -(2 + 7x)$$
 b)  $\frac{2x+5}{5} = \frac{3x+1}{2} + \frac{-x+7}{2}$ 

## **General Guidelines for Solving Linear Equations:**

		$\frac{1}{8}(2x-1)+3=\frac{5}{6}(5-3x)$ /·24
٠	Clear fractions or decimals by	δ σ
	multiplying both sides of the equation by LCD, or a power of 10	3(2x - 1) + 72 = 20(5 - 3x)
•	<b>Open brackets</b> by applying the distributive property	6x - 3 + 72 = 100 - 60x
•	<b>Collect and combine</b> variable terms on one side of the equation and free	6x + 60x = 100 + 3 - 72
•	numbers on the other side <b>Isolate the variable</b> by dividing by	$66x = 31 \qquad / \div 66$
	the linear coefficient	$x = \frac{31}{66}$

## **Solving Formulas:**

formula – a general rule describing relationship between various quantities (variables)

When solving formulas for a given variable, remember to

- highlight the variable of interest and treat other variables as numbers ex. 2L + 2W = P solve for L
- **reverse** (undo) **operations** to reach the given variable;

here are the pairs of reversing operations:

 $\cdot \quad \div \quad (*)^2 \quad \sqrt{*}$ 

+

ex. 
$$\frac{h(a+b)}{2} = A$$
 solve for *a*

- keep the given variable in the numerator ex.  $r = \frac{d}{t}$  solve for t
- keep the given variable in one place ex.  $\pi r + 3r = P$  solve for r

- 2. A sheet of standard-size copy paper has the width W = 8.5 in and the length L = 11 in. A ream of this paper has 500 sheets and a volume V = 187 in<sup>3</sup>. If x represents the thickness of one sheet,
  - a) write a formula for the volume *V* of the ream in terms of the width *W*, length *L*, and thickness *x*,
  - b) solve this formula for x,
  - c) and evaluate it to find the thickness of one such sheet of paper.

