BOARD NOTES

8 NOVEMBER 2018

BORGER INDEPENDENT SCHOOL DISTRICT

1926

CC ALGEBRA
CHAPTER 5 – SYSTEM OF EQUATIONS & INEQUALITIES

- SECTION 5.1 - SYSTEMS OF EQUATIONS IN TWO VARIABLES

Objectives:

- Determine whether an ordered pair is a solution of a linear system
- Solve linear systems by substitution
- Solve linear systems by elimination
- Identify systems that do not have exactly one ordered-pair solution
- Solve problems using systems of linear equations

Solving Linear Systems by Substitution

1. Solve either of the equations for one variable in terms of the other. (If one of the equations is already in this form, you can skip this step.)
2. Substitute the expression found in step 1 into the *other* equation. This will result in an equation in one variable.
3. Solve the equation containing one variable.
4. Back-substitute the value found in step 3 into one of the original equations. Simplify and find the value of the remaining variable.
5. Check the proposed solution in both of the system's given equations.

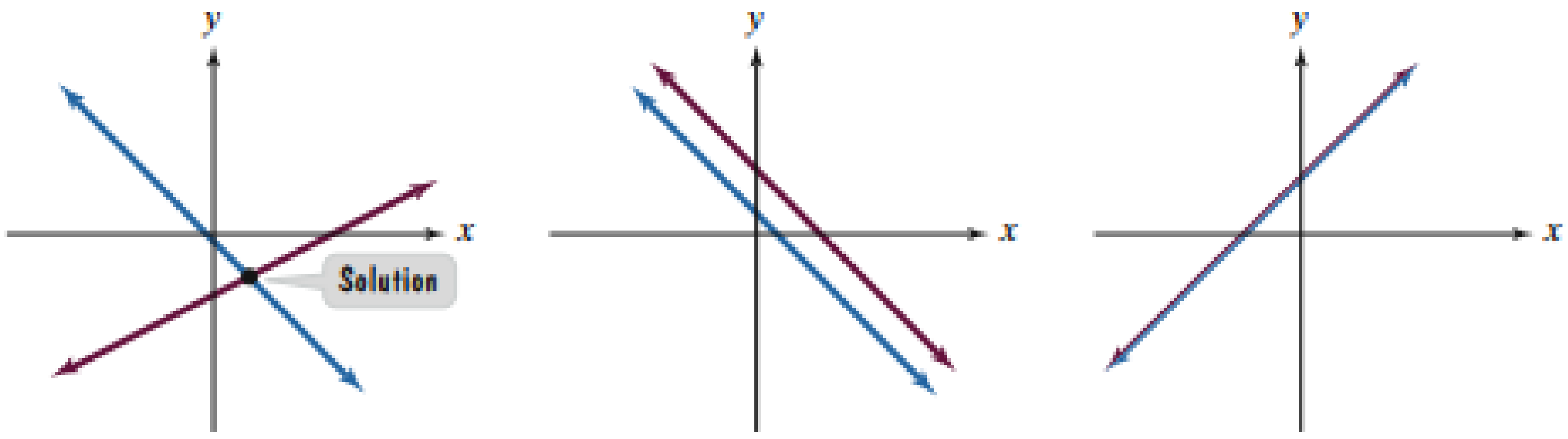
Solving Linear Systems by Addition

1. If necessary, rewrite both equations in the form $Ax + By = C$.
2. If necessary, multiply either equation or both equations by appropriate nonzero numbers so that the sum of the x-coefficients or the sum of the y-coefficients is 0.
3. Add the equations in step 2. The sum is an equation in one variable.
4. Solve the equation in one variable.
5. Back-substitute the value obtained in step 4 into either of the given equations and solve for the other variable.
6. Check the solution in both of the original equations.

The Number of Solutions to a System of Two Linear Equations

The number of solutions to a system of two linear equations in two variables is given by one of the following. (See **Figure 5.3**.)

Number of Solutions	What This Means Graphically
Exactly one ordered-pair solution	The two lines intersect at one point.
No solution	The two lines are parallel.
Infinitely many solutions	The two lines are identical.



Exactly one solution

No solution (parallel lines)

Infinitely many solutions (lines coincide)

FIGURE 5.3 Possible graphs for a system of two linear equations in two variables

① $2x = 7y - 17$

② $5y = 17 - 3x$

① $2x - 7y = -17$

② $3x + 5y = 17$

Elim y

①·5 $10x - 35y = -85$

②·7 $21x + 35y = 119$

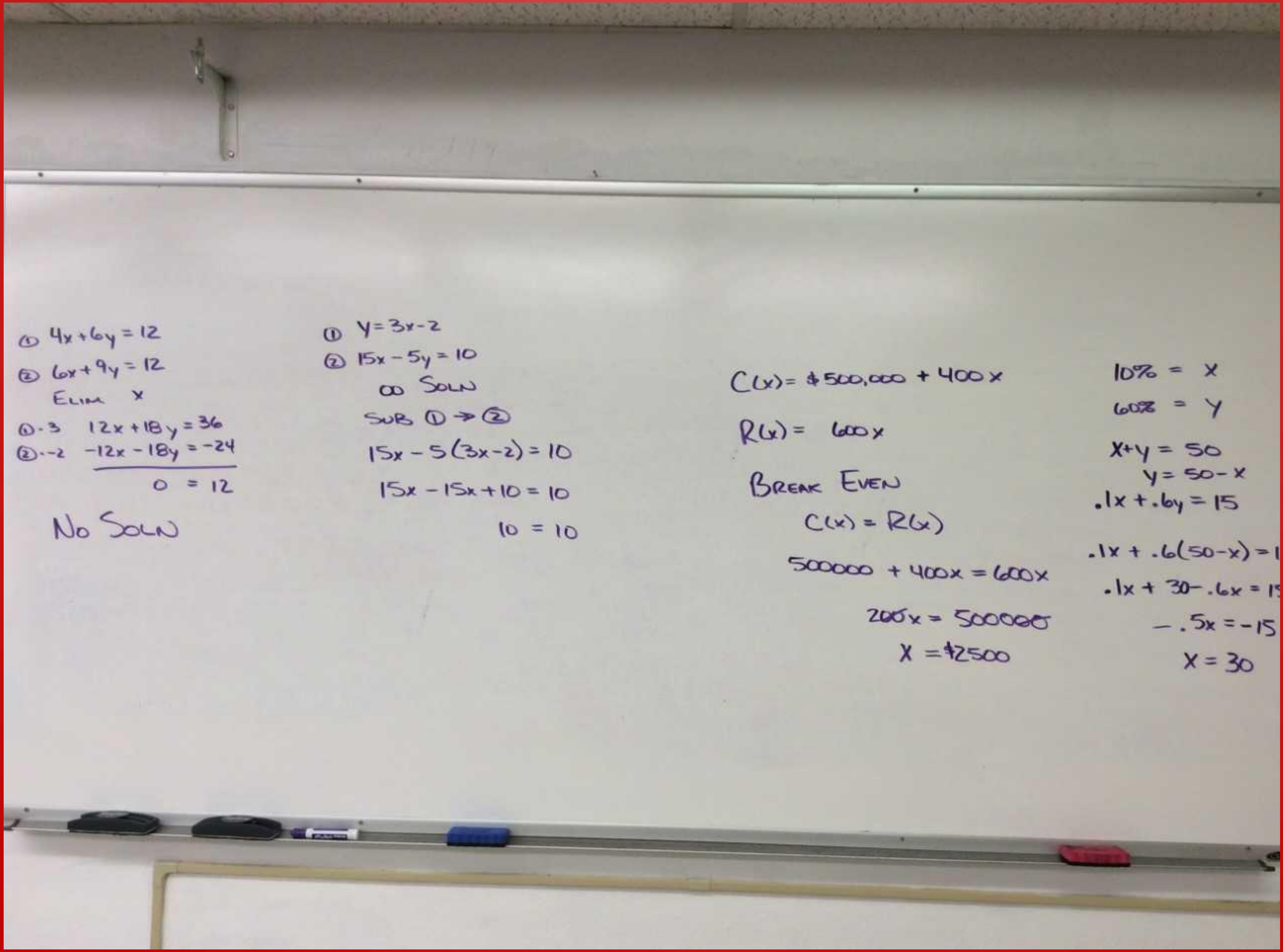
$31x = 34$

$x = \frac{34}{31} \rightarrow$ ②

$5y = 17 - 3\left(\frac{34}{31}\right)$

$y = \frac{85}{31}$

$\left(\frac{34}{31}, \frac{85}{31}\right)$



① 4x+6y=12
② 6x+9y=12
Elim x
①·3 12x+18y=36
②·-2 -12x-18y=-24
0 = 12
No Soln
① y=3x-2
② 15x-5y=10
∞ Soln
Sub ① → ②
15x-5(3x-2)=10
15x-15x+10=10
10 = 10
C(x)= $500,000 + 400x
R(x)= 600x
Break Even
C(x) = R(x)
500000 + 400x = 600x
200x = 500000
X = $2500
10% = x
60% = y
x+y = 50
y = 50-x
.1x + .6y = 15
.1x + .6(50-x) =
.1x + 30 - .6x =
-.5x = -15
x = 30

Revenue and Cost Functions

A company produces and sells x units of a product.

Revenue Function

$$R(x) = (\text{price per unit sold})x$$

Cost Function

$$C(x) = \text{fixed cost} + (\text{cost per unit produced})x$$

Technology is now promising to bring light, fast, and beautiful wheelchairs to millions of people with disabilities. A company is planning to manufacture these radically different wheelchairs. The fixed cost will be \$500,000 and it will cost \$400 to produce each wheelchair. They will be sold for \$600.

a. Write the cost function

b. Write the revenue function

c. Determine the break-even point.

d. Write the profit function.

The Profit Function

The profit, $P(x)$, generated after producing and selling x units of a product is given by the **profit function**

$$P(x) = R(x) - C(x),$$

where R and C are the revenue and cost functions, respectively.

- A chemist working on a flu vaccine needs to mix 10% sodium-iodine solution with a 60% sodium iodine solution to obtain 50 milliliters of a 30% sodium-iodine solution. How many milliliters of the 10% solution and the 60 % solution should be mixed?