

# BOARD NOTES

12 NOVEMBER 2018



# CC ALGEBRA

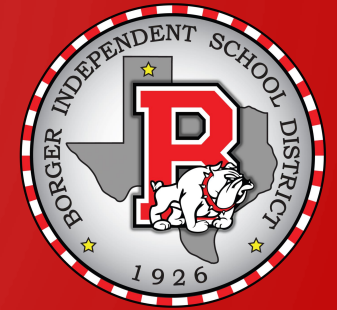
## CHAPTER 5 – SYSTEM OF EQUATIONS & INEQUALITIES



- SECTION 5.2 - SYSTEMS OF EQUATIONS IN THREE VARIABLES

Objectives:

- Verify the solution of a system of linear equations in three variables
- Solve systems of linear equations in three variables
- Solve problems using systems in three variables



## Solving Linear Systems in Three Variables by Eliminating Variables

1. Reduce the system to two equations in two variables. This is usually accomplished by taking two different pairs of equations and using the addition method to eliminate the same variable from both pairs.
2. Solve the resulting system of two equations in two variables using addition or substitution. The result is an equation in one variable that gives the value of that variable.
3. Back-substitute the value of the variable found in step 2 into either of the equations in two variables to find the value of the second variable.
4. Use the values of the two variables from steps 2 and 3 to find the value of the third variable by back-substituting into one of the original equations.
5. Check the proposed solution in each of the original equations.

- ①  $x + 2y - 3z = 9$
- ②  $2x - y + 2z = -8$
- ③  $-x + 3y - 4z = 15$

Elim x

① + ③ = ④    ② + ③ = ⑤

①  $x + 2y - 3z = 9$

③  $-x + 3y - 4z = 15$

④  $5y - 7z = 24$

②  $2x - y + 2z = -8$

③ · 2  $-2x + 6y - 8z = 30$

⑤  $5y - 6z = 22$

Elim y

④ · -1  $-5y + 7z = -24$

⑤  $5y - 6z = 22$

$z = -2 \rightarrow$  ④  $5y - 7(-2) = 24$

$5y = 10$

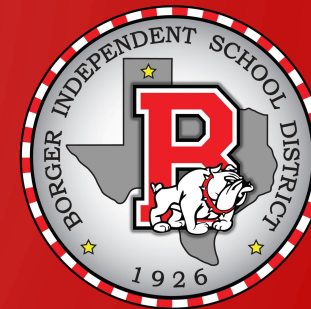
$y = 2, z = -2 \rightarrow$  ①

$x + 2(z) - 3(-2) = 9$

$x = -1$

$(-1, 2, -2)$

$\frac{14}{14} = 1$   
 $\frac{2}{2} = 1$



$$\begin{aligned} \textcircled{1} \quad & 5x - 2y - 4z = 3 \\ \textcircled{2} \quad & 3x + 3y + 2z = -3 \\ \textcircled{3} \quad & -2x + 5y + 3z = 3 \end{aligned}$$

Elim z

$$\textcircled{1} + 2\textcircled{2} = \textcircled{4} \quad 3\textcircled{1} + 4\textcircled{2} = \textcircled{5}$$

$$\begin{aligned} 5x - 2y - 4z &= 3 \\ 6x + 6y + 4z &= -6 \end{aligned}$$

$$\textcircled{4} \quad 11x + 4y = -3$$

$$\begin{aligned} 15x - 6y - 12z &= 9 \\ -8x + 20y + 12z &= 12 \end{aligned}$$

$$\textcircled{5} \quad 7x + 14y = 21$$

Elim x

$$7\textcircled{4} \quad -77x + 28y = -21$$

$$11\textcircled{5} \quad -77x - 154y = -231$$

$$-126y = -252$$

$$y = 2 \rightarrow \textcircled{4}$$

$$11x + 4(2) = -3$$

$$x = -1, y = 2 \rightarrow \textcircled{2}$$

$$3(-1) + 3(2) + 2z = -3$$

$$z = -3$$

$$(-1, 2, -3)$$

$$\textcircled{1} \quad x + z = 8$$

$$\textcircled{2} \quad x + y + 2z = 17$$

$$\textcircled{3} \quad x + 2y + z = 16$$

Solve x in  $\textcircled{1}$

$$x = 8 - z$$

$$\textcircled{2} = \textcircled{4}$$

$$\textcircled{3} = \textcircled{5}$$

$$\textcircled{4} \quad 8 - z + y + 2z = 17$$

$$y + z = 9 \rightarrow z = 5 \rightarrow \textcircled{1} \quad x = 3$$

$$\textcircled{5} \quad 8 - z + 2y + z = 16$$

$$2y = 8$$

$$y = 4 \rightarrow \textcircled{5}$$

