Your Name

Mrs. Theo

11/16/21

Notes

Lesson 1.4 - Solving Systems of 3 Variable Equations

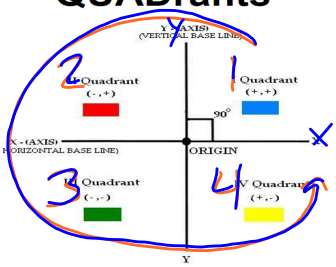
Graphing and Checking

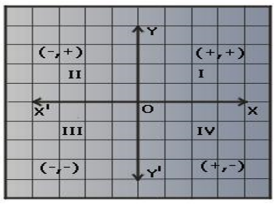
Math Skill Objective:

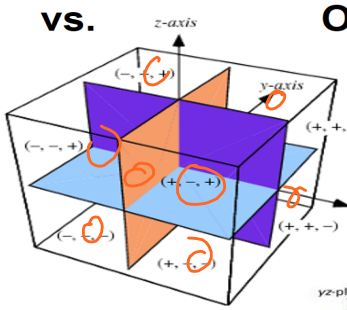
- Visualize solutions of systems of equations in 3 variables
- Check if an ordered triple is a solution to the system.

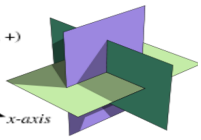
Life Lesson: As you get older, your problems become bigger and more complicated. You must use what you know and extend that knowledge to solve the new and bigger problems you are faced with. One way is to put something aside so that you can solve a simpler problem you are familiar with first, and then go back and solve the entire problem.

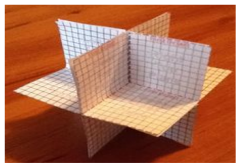
QUADrants vs. OCTants

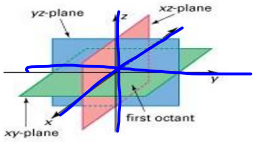


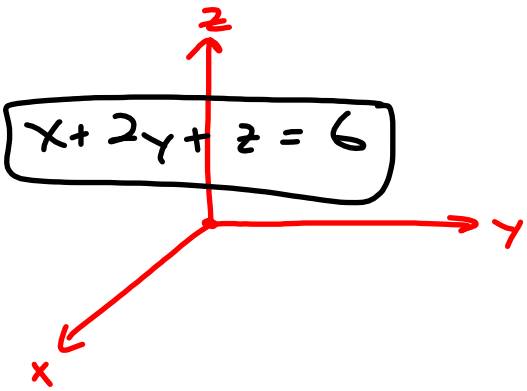


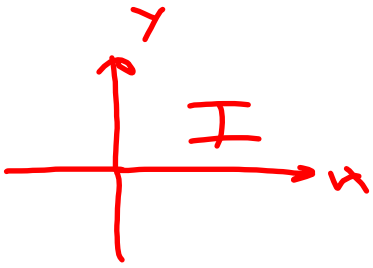








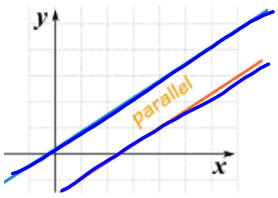




Remember the ways two lines can intersect?
(system of linear inequalities in two variables)

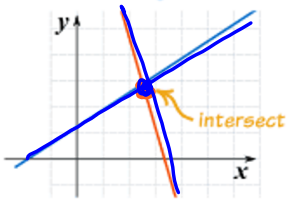
Inconsistent | **Consistent**

Independent | **Dependent**



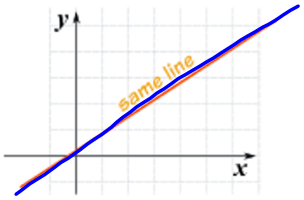
No Solution

Happens when
7 = 9 OR
-11 = 10



One Solution

Happens when
***x* = 9, *y* = 13 OR**
***x* = 0.83, *y* = ½**



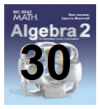
∞ Solutions

Happens when
9 = 9 OR
½ = ½

A linear equation in three variables, *x*, *y*, and *z* is an equation of the form $ax + by + cz = d$ where *a*, *b* and *c* are not all zero.

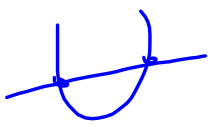
A solution of such a system is an ordered Triple (*x*, *y*, *z*) whose coordinates make each equation true.

The graph of a linear equation in three variables is a plane in 3-dimensional space.



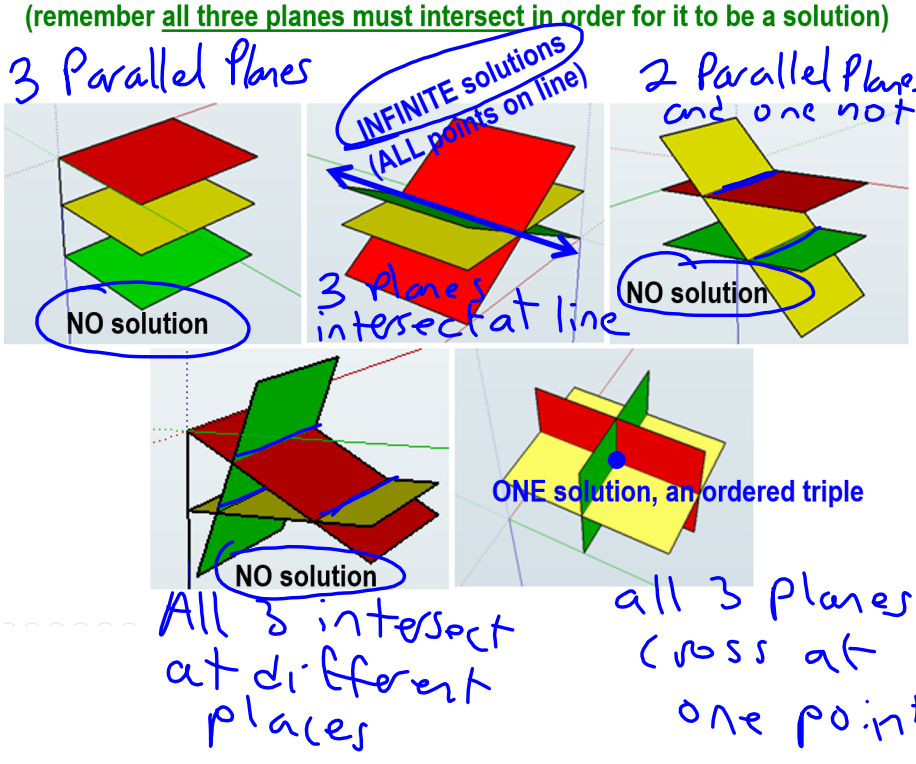
3 Variable System

Types of Solutions

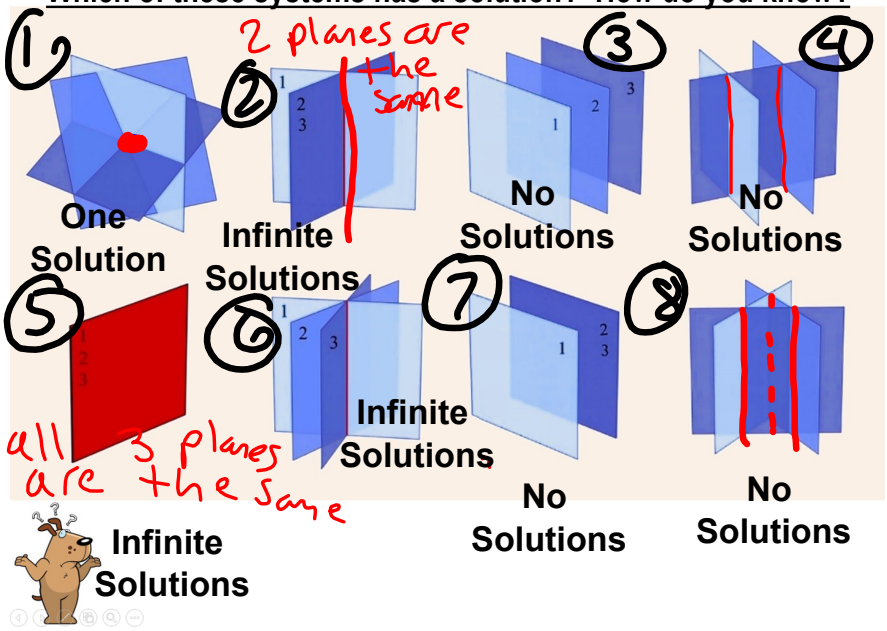


Ways Three Planes Can Intersect & Solution Implications

(remember all three planes must intersect in order for it to be a solution)



Which of these systems has a solution? How do you know?

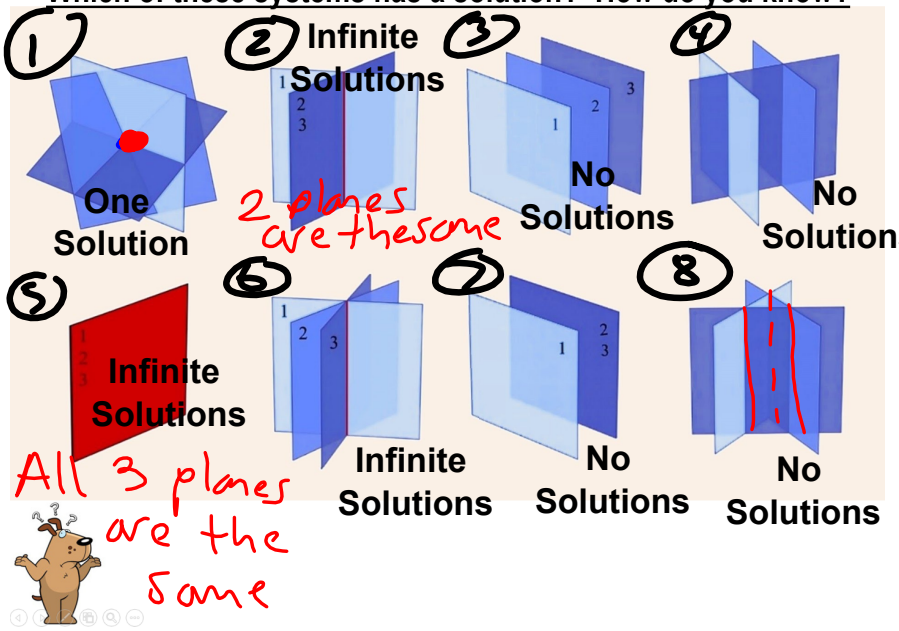


One Solution

Infinite Solutions

No Solutions

Which of these systems has a solution? How do you know?



One Solution

Infinite Solutions

No Solutions

Checking if an ordered triple is a solution

If an ordered triple works for all three equations when substituted in, then it is a solution to the system

Here is a *system of three linear equations* in three variables:

$$\begin{cases} x+2y-3z=-3 \\ 2x-5y+4z=13 \\ 5x+4y-z=5 \end{cases}$$

The ordered triple (2,-1,1) is a **solution** to this system since it is a solution to all three equations.

$$\begin{cases} 2+2(-1)-3(1)=2-2-3=-3 \\ 2(2)-5(-1)+4(1)=4+5+4=13 \\ 5(2)+4(-1)-1=10-4-1=5 \end{cases}$$

$-3 = -3$ ✓

$13 = 13$ ✓

$5 = 5$ ✓

Decide whether the given ordered triple is a solution of the system.

2. $(-1, -2, 5)$

$$2x + y - 5z = -29$$
$$6x + 4y - z = -19$$
$$x + y + 2z = 7$$

$2(-1)+(-2)-5(5)=-29$

$-2-2-25=-29$

$-29=-29$ ✓

$6(-1)+4(-2)-(5)=-19$

$-6-8-5=-19$

$-19=-19$ ✓

$(-1)+(-2)+2(5)=7$

$-1-2+10=7$

$7=7$ ✓

$(-1,-2,5)$ is a solution to the system

Decide whether the given ordered triple is a solution of the system.

2. $(-1, -2, 5)$ (x, y, z)

$2x + y - 5z = -29$ ✓

$6x + 4y - z = -19$ ✓

$x + y + 2z = 7$ ✓

$2(-1) + (-2) - 5(5) = -29$

$-2 - 2 - 25 = -29$

$-29 = -29$ ✓

$6(-1) + 4(-2) - (5) = -19$

$-6 - 8 - 5 = -19$

$-19 = -19$ ✓

$(-1) + (-2) + 2(5) = 7$

$-1 - 2 + 10 = 7$

$7 = 7$ ✓

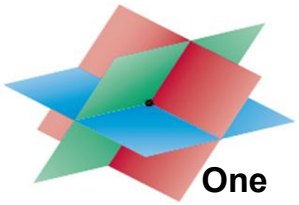
$(-1, -2, 5)$ is a solution to this system

Side Note

if it doesn't work for one, it is not a solution to the system

Homework: Solving by Graphing and Checking Solutions for Systems of Equations 3 Variables

Which of these systems has a solution? How do you know?

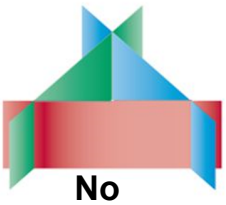


One Solution

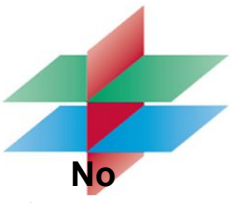
Infinite Solutions

One Solution

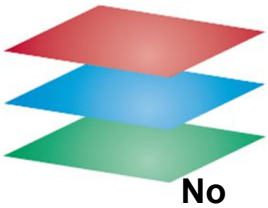
Infinite Solutions



No Solutions



No Solutions



No Solutions

No Solutions

Homework:

You must show your substitution and what you get that proves the triple is or is not a solution

To be a system solution, an ordered triple must satisfy ALL three equations

Decide whether the given ordered triple is a solution of the system.

1. $(0, 0, 3)$

$3x + 4y + z = 3$

$-2x + 7y + 2z = 6$

$-10x + 12y - z = -3$

2. $(-1, -2, 5)$

$2x + y - 5z = -29$

$6x + 4y - z = -19$

$x + y + 2z = 7$

3. $(0, 0, 0)$

$x + y + z = 0$

$2x + 3y - z = 0$

$3x + y - 4z = 1$

4. $(-1, -3, -2)$

$x - 5y + 6z = 2$

$3x - y + 8z = -16$

$4x + 2y - 7z = 4$

5. $(5, 7, 1)$

$x + y + z = 13$

$2x - 7y + 5z = -34$

$3x + y + 4z = 25$

6. $(-4, 8, -9)$

$x + 2y - 3z = 39$

$2x + y - 7z = -63$

$3x + y + z = -13$

2z

2z

Homework:

You must show your substitution and what you get that proves the triple is or is not a solution

To be a system solution, an ordered triple must satisfy ALL three equations

Decide whether the given ordered triple is a solution of the system.

1. $(0, 0, 3)$
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$-10x + 12y - z = -3$

2. $(-1, -2, 5)$
$2x + y - 5z = -29$
$6x + 4y - z = -19$
$x + y + 2z = 7$

3. $(0, 0, 0)$
$x + y + z = 0$
$2x + 3y - z = 0$
$3x + y - 4z = 1$

4. $(-1, -3, -2)$
$x - 5y + 6z = 2$
$3x - y + 8z = -16$
$4x + 2y - 7z = 4$

5. $(5, 7, 1)$
$x + y + z = 13$
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6. $(-4, 8, -9)$
$x + 2y - 3z = 39$
$2x + y - 7z = -63$
$3x + y + z = -13$