

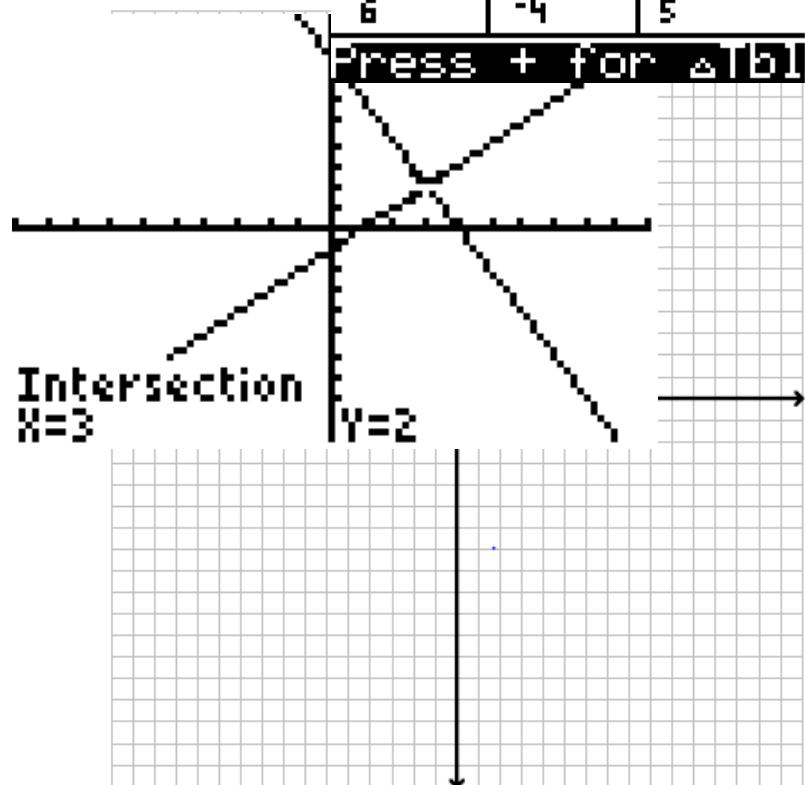
Warm Up:

Solve the following linear system of equations; algebraically or graphically:

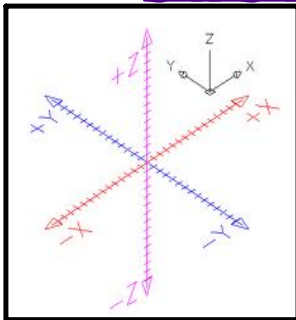
$$\begin{aligned}
 8 - 2x - x + 1 &= 0 \\
 -3x + 9 &= 0 \\
 -3x &= -9 \\
 x &= 3 \\
 (3, 2)
 \end{aligned}$$

$$\begin{aligned}
 y + 2x &= 8 \\
 y &= 8 - 2x \\
 y - x + 1 &= 0
 \end{aligned}$$

X	Y ₁	Y ₂
0	8	-1
1	6	0
2	4	1
3	2	2
4	0	3
5	-2	4



3 x 3 Linear Systems of Equations



Consider a linear equation in 3 variables x , y , and z , such as $3x - 2y + z = 7$. Any ordered triple (x, y, z) that makes the equation true is said to be a solution to the equation. For example, $(2, 1, 3)$ is a solution. However, $(5, 2, 4)$ is not a solution.

$$7 = 7 \checkmark$$

$$3(2) - 2(1) + 3 = 7$$

$$3(5) - 2(2) + 4 = 7$$

$$15 \neq 7 \times$$

Steps for solving 3 equations / 3 unknowns

- Step 1. Using 2 equations, eliminate a variable. You will end up with a new equation (eq 4) that will still have two variables.
- Step 2. Repeat step 1 using 2 different equations and eliminate the **SAME** variable. This will be new equation (eq 5) that will also have the same variables as eq 4.
- Step 3. Using your 2 new equations (eqs 4 & 5) solve for one variable.
- Step 4. Substitute the variable back into either equation 4 or 5.
- Step 5. Using the two variables you know, substitute both back them into one of your original equations.
- Step 6. Check (3 checks)

I TRY

 $(3, 4, -6)$ Solve for all 3 variables:

$$\textcircled{1} \quad x - 2y + 3z = -23 \quad 3 - 2(4) + 3(-6)$$

$$\textcircled{2} \quad 5y - 2z = 32 \quad 5(4) - 2(-6)$$

$$\textcircled{3} \quad 4z = -24 \quad 4(-6)$$

Step 1: Eq 3

$$-23 \quad 4z = -24$$

32

-24

$$\boxed{z = -6}$$

Step 2: Eq 2

$$5y - 2(-6) = 32$$

$$5y + 12 = 32$$

$$5y = 20$$

$$\boxed{y = 4}$$

Step 3: Eq 1

$$x - 2(4) + 3(-6) = -23$$

$$x - 8 - 18 = -23$$

$$x - 26 = -23$$

$$\boxed{x = 3}$$

WE TRY #1

Solve for all 3 variables:

① $2x + 3y - 4z = -10$

② $2y + 3z = 16$

③ $2y - 5z = -16$

Step 2: Eq 2

$2y + 3(4) = 16$

$2y + 12 = 16$

$2y = 4$

$y = 2$

Step 1: Eq 2 + 3

~~$2y + 3z = 16$~~

~~$-2y + 5z = +16$~~

$8z = 32$

$z = 4$

Step 3: Eq 1

$2x + 10 - 16 = -10$

$2x - 10 = -10$

$2x = 0$

$x = 0$

$(0, 2, 4)$

WE TRY #2

Let's try this one together. NEW PROCEDURE!!!

$$\textcircled{1} x - 3y + 3z = -4$$

$$\textcircled{2} 2x + 3y - z = 15$$

$$\textcircled{3} 4x - 3y - z = 19$$

Step 1: Eq 1+2

$$1x - 3y + 3z = -4$$

$$+ 2x + 3y - z = +15$$

$$\text{Eq 4) } 3x + 2z = 11$$

Step 2: Eq 2+3

$$2x + 3y - z = 15$$

$$+ 4x - 3y - z = +19$$

$$\text{Eq 5) } 6x - 2z = 34$$

Step 3: Eq 4+5

$$3x + 2z = 11$$

$$+ 6x - 2z = +34$$

$$9x = 45$$

$$\boxed{x=5}$$

Step 4: Eq 5

$$30 - 2z = 34$$

$$-2z = 4$$

$$\boxed{z = -2}$$

Step 5: Eq 1

$$5 - 3y + -6 = -4$$

$$-3y - 1 = -4$$

$$-3y = -3$$

$$\boxed{y=1}$$

$$\boxed{(5, 1, -2)}$$

Homework

$$\begin{aligned} 2. \quad & x - y + 4z = -29 \\ & 3x - 2y - z = -6 \\ & 2x - 5y + 6z = -55 \end{aligned}$$

$$(-2, 3, -6)$$

$$\begin{aligned} * 5. \quad & 2x - 3y + 5z = -5 \\ & 2y - 3z = 4 \\ & 4z = -8 \end{aligned}$$

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