Systems of Equations Review

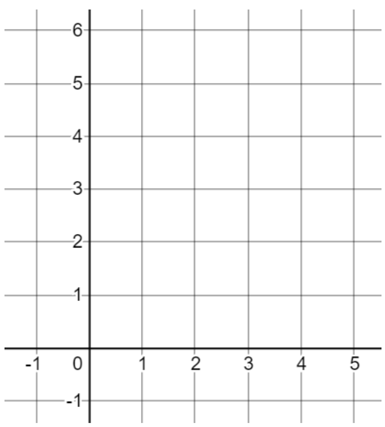
A **system of equations** is when we have more than one equation.

The **solution** is the point (x, y) where the two functions cross each other. We can find the solution to a system of equations graphically or algebraically (using elimination, comparison, or substitution).

Using a graph to solve:
The find a solution, graph both functions. The solution is the point where the functions cross, written as an ordered pair (x, y). Remember, you may need to re-arrange the equation before you can graph it.

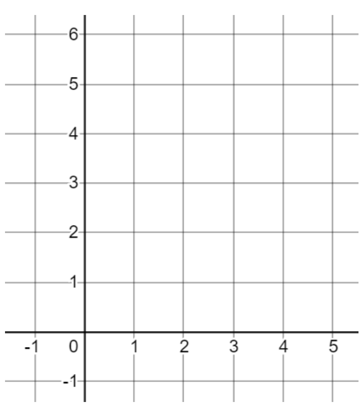
Ex: Find the solution to the linear system.

$y = 2x + 1$ and $x + y = 4$

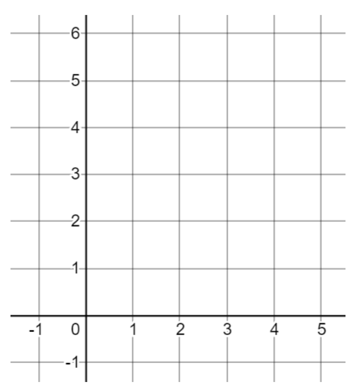


Try these questions! Find the solution to the linear systems.

1a) $y = 3$ and $2x + 4y = 16$



b) $y = 4x$ and $y = -2x + 6$



The graphing method is not an accurate way to solve linear systems. For example, it is difficult to tell the different between $(2.3, 4.6)$ and $(2.2, 4.7)$. Therefore, we will use algebra to solve linear systems.

There are 3 methods we can use: elimination, comparison, and substitution.

Using the elimination method to solve:

- Both lines must be in the form $Ax + By = C$.
- Multiply the entire first equation by the coefficient of x in the second equation.
- Multiply the entire second equation by the coefficient of x in the first equation, but change the sign.
- Add the two equations.
- Solve for the remaining variable.
- Use the solution in either equation to solve for the other variable.
- Write the solution (x, y).

Ex: Find the solution to the linear systems.

a) $2x + 5y = 16$ and $3x - 4y = 1$

b) $4x - 5y = 10$ and $y = -\frac{5}{3}x + 35$

Try these questions! Find the solution to the linear systems.

2a) $2x + 5y = -4$ and $3x - 2y = 13$

b) $3x + 4y = -6$ and $y = -2x + 1$

Using the comparison method to solve:

- Both lines must be in the form $y = ax + b$.
- Take the $ax + b$ pieces from each equation and set them equal to each other $ax + b = ax + b$.
- Solve for x.
- Use either equation (and the value of x you just found) to solve for y.
- Write the solution (x, y).

Ex: Find the solution to the linear systems.

a) $y = 2x + 1$ and $y = -1.5x + 4.5$ b) $y = -2x - 6$ and $5x + y = -3$

Try these questions! Find the solution to the linear systems.

3a) $y = 2x + 5$ and $y = -4x + 11$ b) $y = 0.5x + 2$ and $y - 2x = -1$

Using the substitution method to solve:

- This method works best if we already know the value of x or y.
- Use the equation that has both variables and replace the known variable.
- Solve for the missing variable.
- Write the solution as (x, y).

Ex: Find the solution to the linear systems.

a) $x = 2$ and $y = 3x + 8$

b) $y = 3$ and $3x + 4y = 20$

Try these questions! Find the solution to the linear systems.

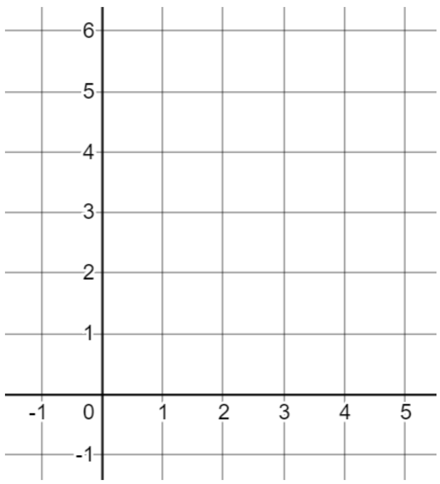
4a) $y = 5$ and $y = 2x - 15$

b) $x = 4$ and $3x + 2y = 20$

Practice Questions

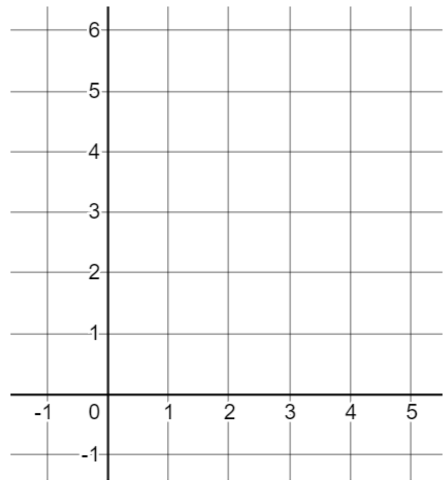
1) Solve the system using graphing:

$y = 4x - 10$ and $y = \frac{1}{3}x + 1$



2) Solve the system using graphing:

$y = -3x + 4$ and $y + 2 = 3x$



3) Solve the system using elimination:

$8x - 6y = -20$ and $-16x + 7y = 30$

4) Solve the system using elimination:

$-4y - 11x = 36$ and $20 = -10x - 10y$

5) Solve the system using comparison:
$y = x - 13$ and $y = -2x + 5$

6) Solve the system using comparison:
$y = -4x + 2$ and $x - y = 3$

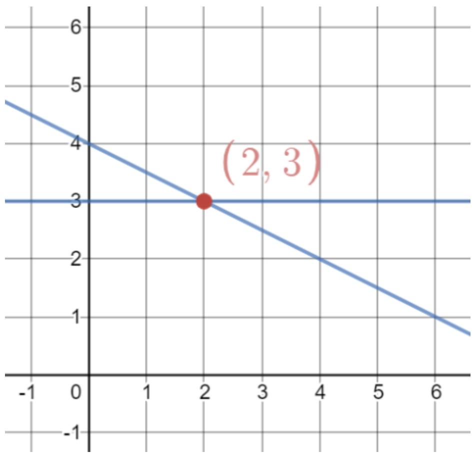
7) Solve the system using substitution:
$y = -5$ and $5x + 4y = -20$

8) Solve the system using substitution:
$x = 3$ and $4x - y = 20$

Answer Key

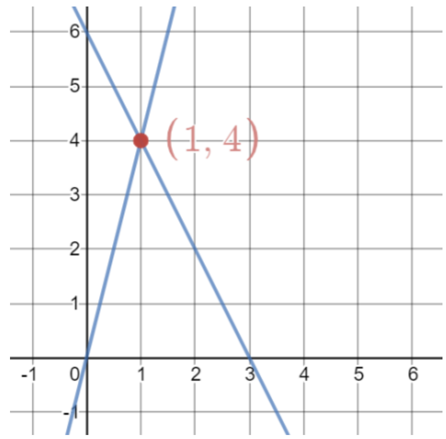
Questions in the Notes

1a)



The solution is $(2, 3)$

1b)



The solution is $(1, 4)$

2a) The solution is $(3, -2)$

2b) The solution is $(2, -3)$

3a) The solution is $(1, 7)$

3b) The solution is $(2, 3)$

4a) The solution is $(10, 5)$

4b) The solution is $(4, 4)$

Practice Questions

1) The solution is $(3, 2)$
2) The solution is $(1,1)$
3) The solution is $(-1, 2)$
4) The solution is $(-4, 2)$
5) The solution is $(6, -7)$
6) The solution is $(1, -2)$
7) The solution is $(0, -5)$
8) The solution is $(3, -8)$