

Lesson 9: Graphing Systems of Linear Equations

CC attribute: *Beginning and Intermediate Algebra* by T. Wallace.



Objective: Solve linear systems by graphing.

Students will be able to:

- Solve linear systems by graphing both equations on one coordinate plane.
- Write system solutions as ordered pairs in the form (x, y) .
- Verify the accuracy of a solution by plugging it into each equation in the system.

Prerequisite Knowledge:

- Find the slope-intercept form of a linear equation.
- Graph linear equations in slope-intercept form.
- Plot points on the coordinate plane.

Lesson:

I - Motivating Example(s):

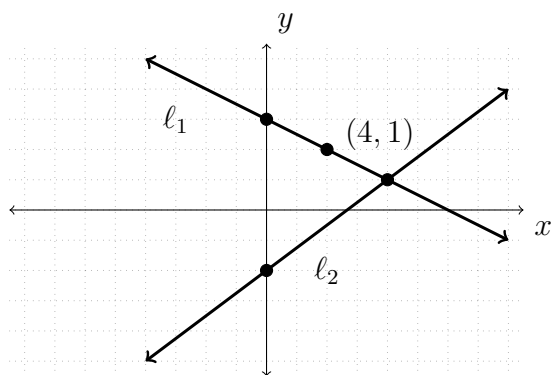
Solve the following system of equations.

$$\begin{cases} y = -\frac{1}{2}x + 3 \\ y = \frac{3}{4}x - 2 \end{cases}$$

First identify slopes and y - intercepts.

$$\begin{array}{l} \text{Line 1 : } m = -\frac{1}{2}, \quad b = 3 \\ \text{Line 2 : } m = \frac{3}{4}, \quad b = -2 \end{array}$$

Next graph both lines on the same plane.



To graph each equation, we start at the y -intercept and use the slope $\left(\frac{\text{rise}}{\text{run}}\right)$ to get the next point, then connect the dots.

Remember a line with a negative slope decreases from left to right.

Use slopes to find the intersection point, $(4, 1)$. This is our solution.

Often our equations won't be in slope-intercept form and we will first have to solve both for y so we can identify the slope and y -intercept.

II - Demo/Discussion Problems:

Solve each of the following systems of linear equations by graphing.

1. $\begin{cases} y = 2x - 4 \\ y = -2x + 4 \end{cases}$

2. $\begin{cases} 2y - 3x = -8 \\ 2y - 3x = 2 \end{cases}$

3. $\begin{cases} 6x - 3y = -9 \\ 2x + 2y = -6 \end{cases}$

III - Practice Problems:

Solve each of the following systems of linear equations by graphing.

1. $\begin{cases} y = -x + 1 \\ y = -5x - 3 \end{cases}$

10. $\begin{cases} y = \frac{1}{2}x + 4 \\ y = \frac{1}{2}x + 1 \end{cases}$

20. $\begin{cases} 2x - y = -1 \\ 3 = -2x - y \end{cases}$

2. $\begin{cases} y = -\frac{3}{4}x + 1 \\ y = -\frac{3}{4}x + 2 \end{cases}$

11. $\begin{cases} 6x + y = -3 \\ x + y = 2 \end{cases}$

21. $\begin{cases} -y + 7x = 4 \\ -y + 7x = 3 \end{cases}$

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

12. $\begin{cases} x + 2y = 6 \\ 5x - 4y = 16 \end{cases}$

22. $\begin{cases} y = -x - 2 \\ y = \frac{2}{3}x + 3 \end{cases}$

4. $\begin{cases} x - y = 4 \\ 2x + y = -1 \end{cases}$

13. $\begin{cases} -2y + x = 4 \\ 2 = -x + \frac{1}{2}y \end{cases}$

23. $\begin{cases} y = 2x - 4 \\ y = \frac{1}{2}x + 2 \end{cases}$

5. $\begin{cases} 2x + y = 2 \\ x - y = 4 \end{cases}$

14. $\begin{cases} 16 = -x - 4y \\ -2x = -4 - 4y \end{cases}$

24. $\begin{cases} x + 4y = -12 \\ 2x + y = 4 \end{cases}$

6. $\begin{cases} 9y + 6x = 36 \\ 3y - 6x = -12 \end{cases}$

15. $\begin{cases} y = -3 \\ y = -x - 4 \end{cases}$

25. $\begin{cases} 3x + 2y = 2 \\ 3x + 2y = -6 \end{cases}$

7. $\begin{cases} 3 + y = -x \\ -4 - 6x = -y \end{cases}$

16. $\begin{cases} y = \frac{1}{3}x + 2 \\ y = -\frac{5}{3}x - 4 \end{cases}$

26. $\begin{cases} x - y = 3 \\ 5x + 2y = 8 \end{cases}$

8. $\begin{cases} y = -\frac{5}{4}x - 2 \\ y = -\frac{1}{4}x + 2 \end{cases}$

17. $\begin{cases} x + 3y = -9 \\ 5x + 3y = 3 \end{cases}$

27. $\begin{cases} -2y = -4 - x \\ -2y = -5x + 4 \end{cases}$

9. $\begin{cases} y = 2x + 2 \\ y = -x - 4 \end{cases}$

18. $\begin{cases} 2x + 3y = -6 \\ 2x + y = 2 \end{cases}$

28. $\begin{cases} -4 + y = x \\ x + 2 = -y \end{cases}$