

More Problems Involving Systems of Equations

Textbook Reference: Sections 3.1 and 3.2

Where you are instructed to graph by hand, you use graph paper and a ruler.

Start with #1a, 2, 3, 5, 7, 9, 11

1. Graph each system of equations (**on graph paper**) and estimate the solution. Check your solution by plugging it into both equations. You do NOT need to solve these algebraically.

a. $y = \frac{1}{2}x - 3$
 $x + 2y = 6$

b. $3x + y = 12$
 $2x + 2y = 8$

$y = 2x - 1$
c. $x - \frac{1}{2}y = 3$

2. Line A goes through the points (-4,-2) and (6,8). Line B goes through the points (-5,7) and (5,1). Graph the lines and estimate the coordinates of the point where they intersect. Then find the exact coordinates algebraically.

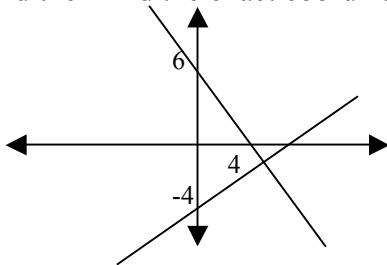
3. The function $f(x)$ is a linear function where $f(2) = 4$ and $f(-4) = 1$. The function $g(x)$ is a linear function whose zero is -1 and y-intercept is 2.

a. Sketch the graphs of $f(x)$ and $g(x)$, then estimate the point of intersection.

b. Write the equations of $f(x)$ and $g(x)$.

c. Algebraically find the exact point of intersection between $f(x)$ and $g(x)$. Hint: use “y” instead of $f(x)$ and $g(x)$ because these are both outputs, and are represented on the y-axis.

4. The two lines below are perpendicular. Some axis intercepts are shown. Write the equations of the lines and then find the exact coordinates of their point of intersection algebraically.



5. A quadrilateral is a geometric shape with four sides (connecting adjacent vertices). A quadrilateral has vertices at (0,0), (1,5), (6,9), and (5,-3). Sketch it, draw the two diagonals, and estimate the coordinates where the diagonals meet. Then write the equations of the diagonals and then find the exact coordinates of their intersection algebraically.

6. The lines $y = 2x + h$ and $y = kx - 4$ intersect at the point (5,1). What are the values of h and k ? [Hint: the point (5,1) must be on both lines.]

7. Triangle ABC is formed by the intersection of the three lines below.

$$x + y = 6$$

$$x - 2y = 6$$

$$y = 3x + 3$$

- Graph the lines and estimate the coordinates of the vertices of ABC.
- Algebraically find the exact coordinates of the vertices.
- Is triangle ABC a right triangle? How can you be sure?

8. The lines $2x - 3y = 10$ and $ax + 5y = 20$ never intersect. What is the value of a ?

9. The system below is NOT a system of linear equations because one is an absolute value function and not a line. Graph them and estimate the two solutions to the system. Then check by plugging in.

$$y = |x| - 4$$

$$y = -\frac{1}{2}x - 1$$

10. Graph $f(x)$ and $g(x)$ and estimate their points of intersection. Then check by plugging them into the equations.

$$f(x) = 2|x - 3.5| + 1$$

$$g(x) = \frac{1}{2}x + 3$$

Answers

2. line A is $y = x + 2$; line B is $y = \frac{-3}{5}x + 4$; they meet at $\left(\frac{5}{4}, \frac{13}{4}\right)$

3. $f(x) = 0.5x + 3$ $g(x) = 2x + 2$ meet at $\left(\frac{2}{3}, \frac{10}{3}\right)$

4a. $y = \frac{-3}{2}x + 6$ and $y = \frac{2}{3}x - 4$ they meet at $\left(\frac{60}{13}, -\frac{12}{13}\right)$

5. the diagonals are $y = 1.5x$ and $y = -2x + 7$; they intersect at (2,3)

6. $h = -9$ and $k = 1$

7b. $(6,0)$, $\left(\frac{3}{4}, \frac{21}{4}\right)$, and $\left(-\frac{12}{5}, -\frac{21}{5}\right)$ c. no pair of lines has slopes that make them perpendicular

8. 7.5

9. (2,-2) and (-6,2)

10. (2,4) and (6,6)