

In Summary

Key Ideas

- When solving a system of linear relations, the point of intersection of their graphs is the solution to that system of linear equations.

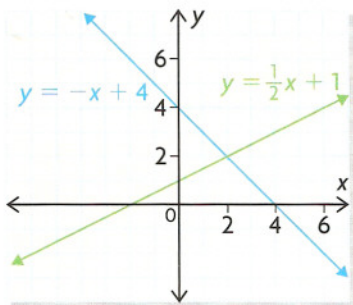
Need To Know

- The coordinates of the point of intersection can be estimated by graphing the relations by hand.
- Graphing technology helps determine the point of intersection with greater accuracy than is possible with a hand-drawn graph.
- A system of linear equations can have one point of intersection, zero points of intersection (if the graphs are parallel), or infinite points of intersection (if they are equivalent equations).

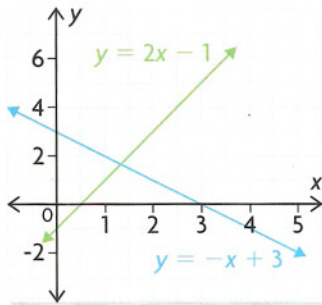
CHECK Your Understanding

1. Determine the point of intersection for each system of linear equations shown below.

a) $y = \frac{1}{2}x + 1$ and $y = -x + 4$



c) $y = 2x - 1$ and $y = -x + 3$

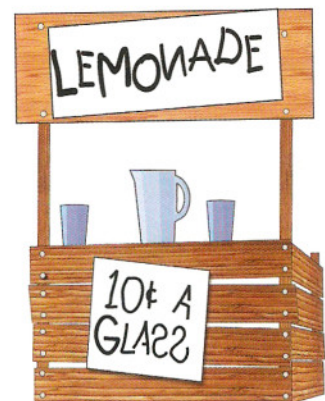


b) $y = x + 1$ and $y = 4x - 5$

d) $y = x$ and $y = -x$

2. Bill wants to earn extra money selling lemonade in front of his house. It costs \$1.20 to start his business and each glass of lemonade costs \$0.06 to make. He plans to sell the lemonade for \$0.10 a glass.

- Write an equation that represents his cost.
- Write an equation that represents his revenue.
- Graph both equations on the same set of axes.
- What does the point of intersection mean in this case?
- Does Bill make a profit or lose money for
 - 20 glasses sold?
 - 35 glasses sold?
 - 50 glasses sold?



PRACTISING

3. Determine the point of intersection of each pair of lines.
 - a) $y = -3x - 2$ and $2x + 3y = 5$
 - b) $2x + 4y = 7$ and $-x + 0.75y = 5$
 - c) $0.25x - 0.5y = 1$ and $3.25x + 4y = 22.5$
 - d) $y = 3x + 6$ and $1 = 3x - y$
4. The sum of two integers is 42. The difference of the two numbers is 17.
 - a) Create a system of linear equations to model each statement above.
 - b) Determine the integers using a graph.
5. Mike has \$9.85 in dimes and quarters. If there are 58 coins altogether, how many dimes and how many quarters does Mike have?
6. Does each pair of lines intersect at the given point?
 - a) $(2, 3)$: $y = x + 1, y = 4x - 5$
 - b) $(1, -1)$: $y = 5x - 4, y = 2x - 3$
 - c) $(0, 2)$: $y = 3x + 2, y = 5x - 1$
 - d) $(-1, -3)$: $y = 4x + 1, y = x - 5$
7. Given the lines $y = 2$ and $y = 4x + 9$,
 - a) Determine the point of intersection using a graph.
 - b) Create the linear equation that you would solve to determine the x -value of the point of intersection.
 - c) Solve the linear equation in part b) to verify your solution from part a).
8. Determine the point of intersection of each pair of lines:
 - K** a) $y - x = 9$ and $x - \frac{1}{6}y = -\frac{2}{3}$
 - b) $y = 2$ and $y = 5$
 - c) $2x - y = 0$ and $y = 5 + 2x$
 - d) $y = -4$ and $x = 1$
9. Marie charges \$3 for every 4 bottles of water purchased from her store. She pays her supplier \$0.25 per bottle, plus \$250 for shelving and water delivery.
 - a) Create a system of two linear equations to model this situation.
 - b) How many bottles of water does she need to sell to break even?
10. Mr. Smith is trying to decide which Internet service provider (ISP) to use for his home computer. UPLINK offers a flat fee of \$19 per month; BLUELINE offers a fee of \$10 per month, but charges \$0.59 per hour after the first 30 hours.
 - A** a) Write the linear relation that models the cost in relation to the number of hours used for each plan.
 - b) Estimate the point at which the costs for both companies would be the same.



- c) What equation would you set up and solve to determine the exact point at which the costs would be the same? Why is this equation reasonable?
- d) What advice would you give to Mr. Smith about which ISP to choose?
11. Mrs. Smith was trying to help her husband decide which ISP to use and she investigated two other companies on her own:
 DOWNLINK offers a plan of \$5 per month plus \$1.15 per hour after the first 20 hours.
 REDLINE offers a plan of \$2.50 per month plus \$1.80 per hour after the first 10 hours.
 Should the Smiths consider either of these two companies in their decision? Why or why not?
12. Determine the point of intersection of each pair of lines:
- a) $5x + 8y - 12 = 0$ and $-5x + 16y - 12 = 0$
- b) $4x + y - 2 = 0$ and $8x + 2y - 4 = 0$
- c) $\frac{1}{3}x - \frac{2}{5}y + \frac{1}{4} = 0$ and $2x - \frac{1}{7}y + \frac{1}{2} = 0$
- d) $5x - 2.5y = 10$ and $3.1x + 4y = 6.2$
13. Given the relation $x + y = 5$, determine a second relation that:
- T** a) intersects $x + y = 5$ at $(2, 3)$
- b) *does not* intersect $x + y = 5$
14. Movies to Go rents DVDs for \$2.50 and has no membership fee. Films **C** 'R' Us rents videos for \$2 but has a \$10 membership fee. What advice would you give to someone who is deciding which video store to use?
15. Why does a system of two linear equations usually have only one solution for each of the two variables?

Extending

16. To determine the point of intersection of $y = 2x + 5$ and $y = 4x - 3$, Elena wrote $2x + 5 = 4x - 3$ and solved the equation. Why is this a reasonable strategy for determining the point of intersection of the two lines?
17. Compare the strategies of solving $3x + 4 = 5x + 3$ by using inverse operations and by graphing the two relations.
18. a) Determine the point(s) of intersection of $y = 2x^2$ and $y = 8$ using a graph.
- b) Create and solve the equation that you would use to determine where the point of intersection lies.
- c) Are your solutions from parts a) and b) the same? Explain.