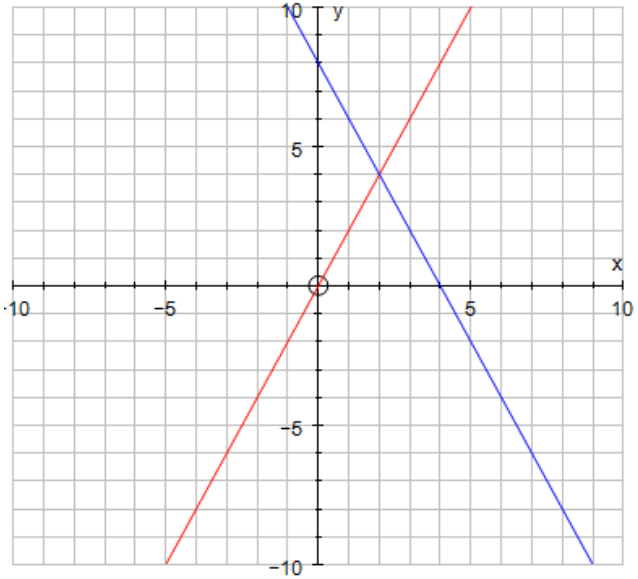
Objectives To solve systems of equations by graphing
To analyze special systems

Practice and Problem-Solving Exercises

MATHEMATICAL PRACTICES

10. $y = 2x$

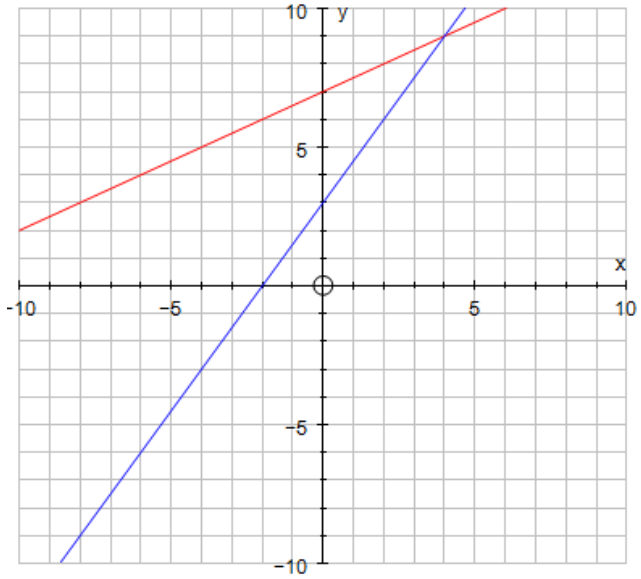
$y = -2x + 8$



10. (2, 4)

11. $y = \frac{1}{2}x + 7$

$y = \frac{3}{2}x + 3$



11. (4, 9)

Practice and Problem-Solving Exercises

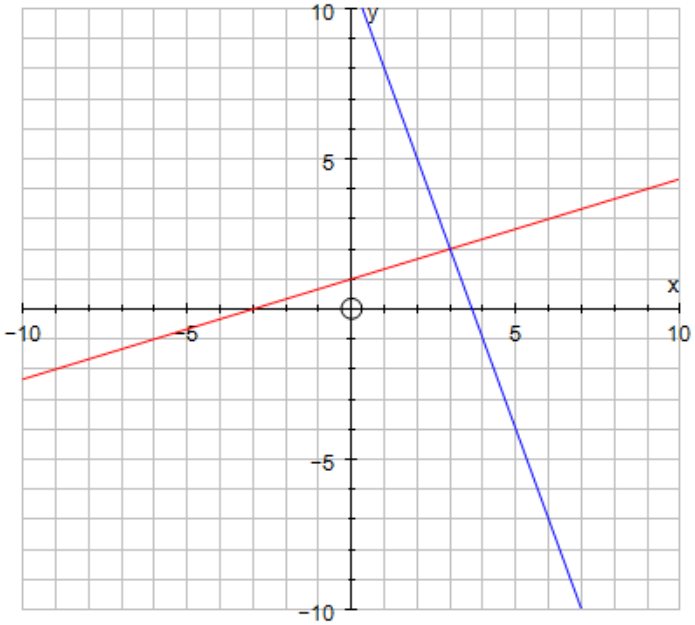
MATHEMATICAL PRACTICES

A Practice Solve each system by graphing. Check your solution.

12. $y = \frac{1}{3}x + 1$

$y = -3x + 11$

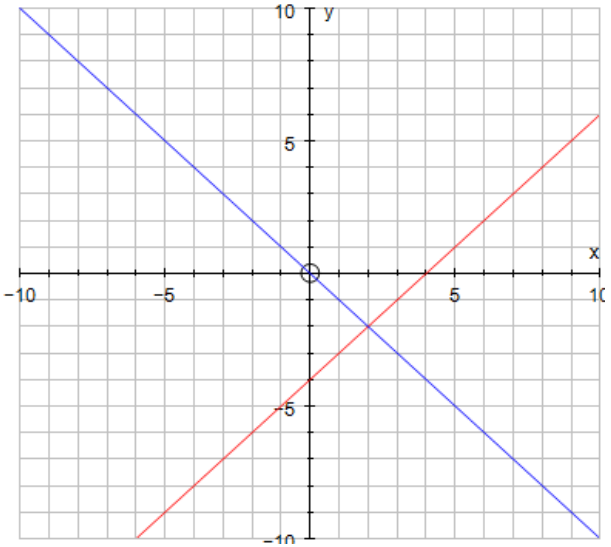
12. (3, 2)



13. $y = x - 4$

$y = -x$

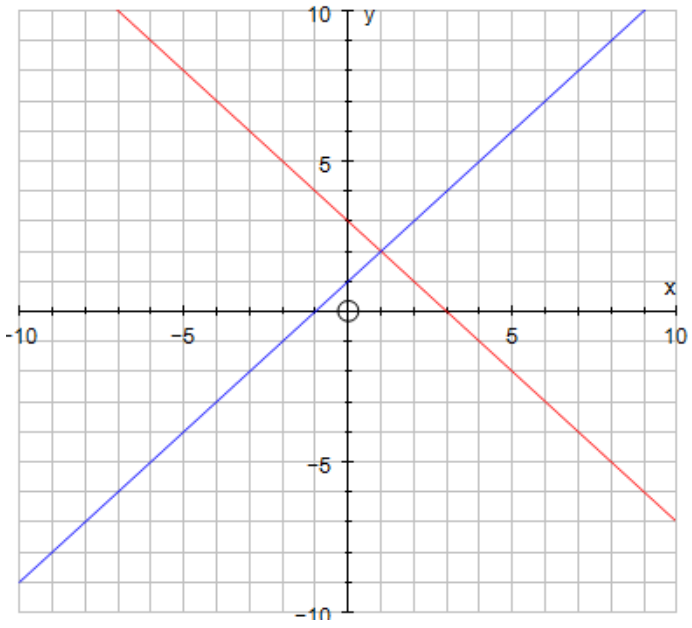
13. (2, −2)



A Practice Solve each system by graphing. Check your solution.

14. $y = -x + 3$

$y = x + 1$

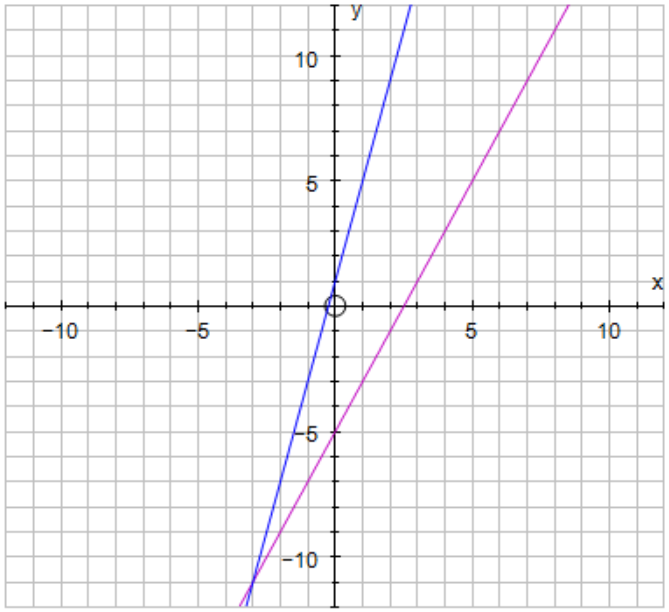


14. (1, 2)

Solve each system by graphing. Check your solution.

15. $4x - y = -1$

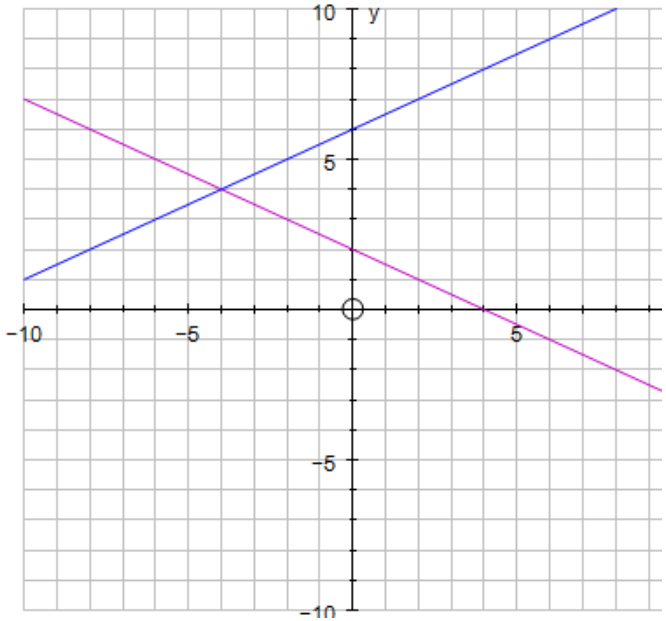
$-x + y = x - 5$



15. (−3, −11)

16. $y = -\frac{1}{2}x + 2$

$y = \frac{1}{2}x + 6$

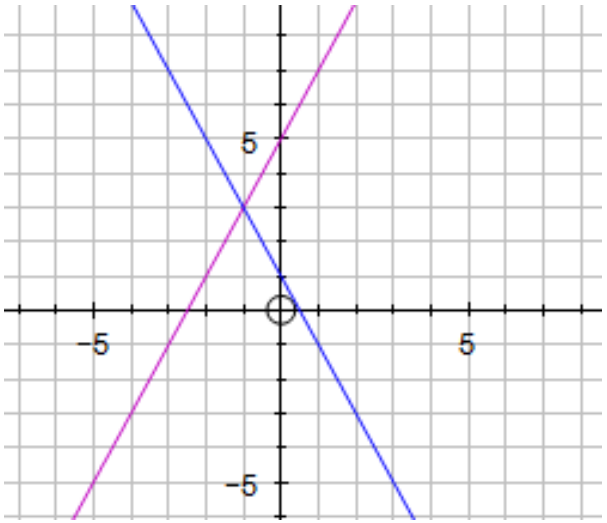


16. (−4, 4)

Solve each system by graphing. Check your solution.

17. $2x - y = -5$

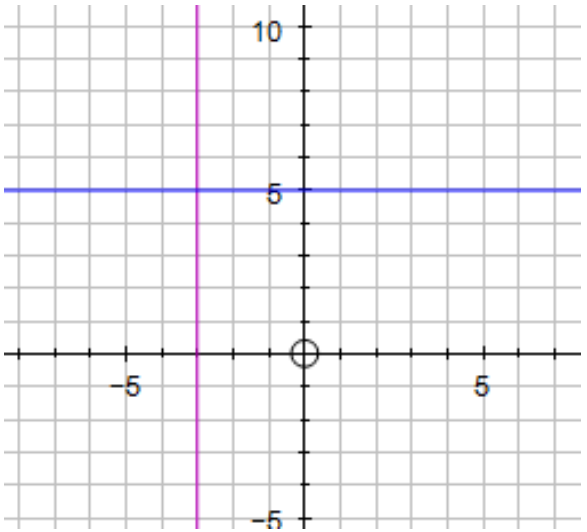
$-2x - y = -1$



17. $(-1, 3)$

18. $x = -3$

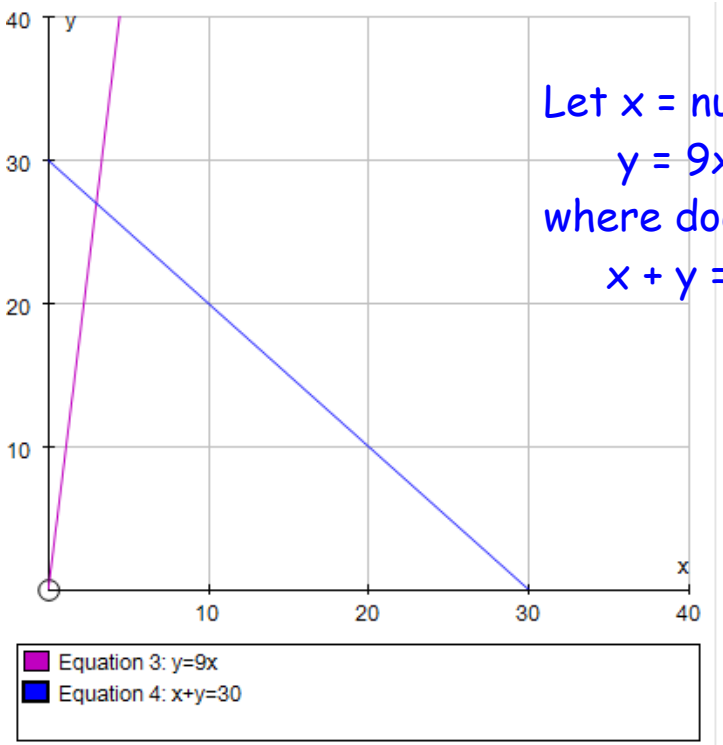
$y = 5$



18. $(-3, 5)$

19. Student Statistics The number of right-handed students in a mathematics class is nine times the number of left-handed students. The total number of students in the class is 30. How many right-handed students are in the class? How many left-handed students are in the class?

19. 27 students; 3 students



Let x = number of lefties

y = 9x

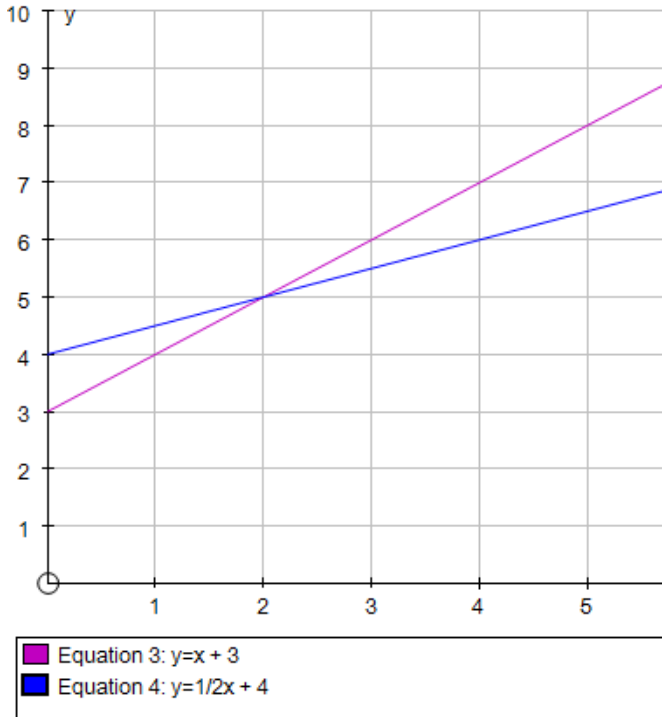
where does this line cross the line

x + y = 30 ?

20. **Plants** A plant nursery is growing a tree that is 3 ft tall and grows at an average rate of 1 ft per year. Another tree at the nursery is 4 ft tall and grows at an average rate of 0.5 ft per year. After how many years will the trees be the same height?

20. 2 yr

tree 1 : y = 1x + 3
tree 2 ; y = 1/2x + 4

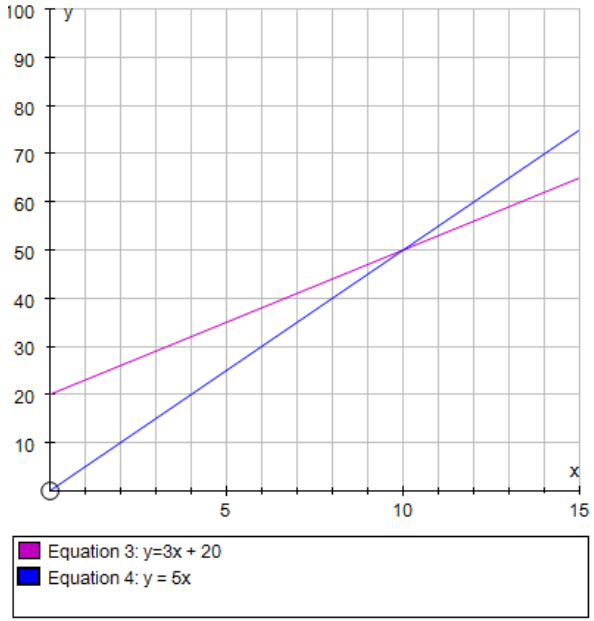


21. **Fitness** At a local fitness center, members pay a $20 membership fee and $3 for each aerobics class. Nonmembers pay $5 for each aerobics class. For what number of aerobics classes will the cost for members and nonmembers be the same?

21. 10 classes

Members : y = 3x + 20

non members : y = 5x

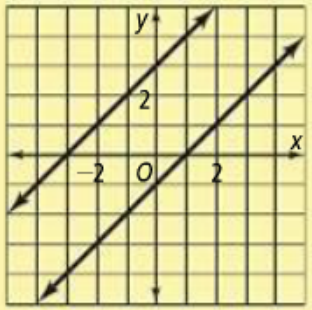


Solve each system by graphing. Tell whether the system has *one solution, infinitely many solutions,* or *no solution.*

22. $y = x + 3$

$y = x - 1$

22.

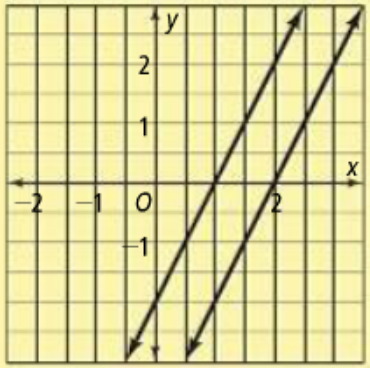


no solution

23. $y = 2x - 1$

$3y = 6x - 5$

23.

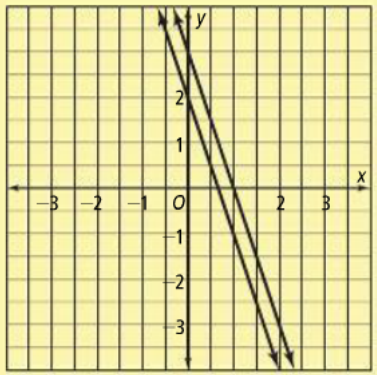


no solution

24. $3x + y = 2$

$4y = 12 - 12x$

24.

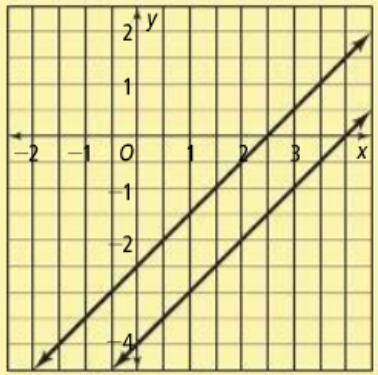


no solution

25. $2x - 2y = 5$

$y = x - 4$

25.



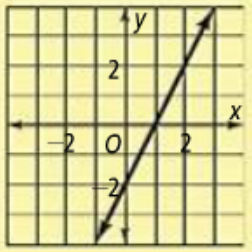
no solution

Solve each system by graphing. Tell whether the system has *one solution, infinitely many solutions,* or *no solution.*

26. $y = 2x - 2$

$2y = 4x - 4$

26.

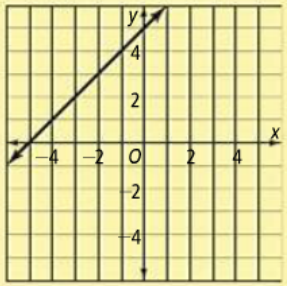


infinitely many solutions

27. $y - x = 5$

$3y = 3x + 15$

27.

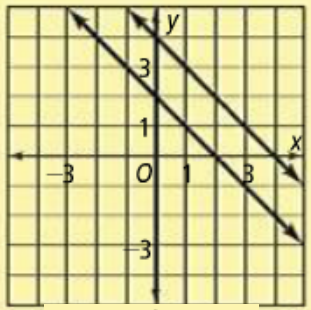


infinitely many solutions

28. $2x + 2y = 4$

$12 - 3x = 3y$

28.

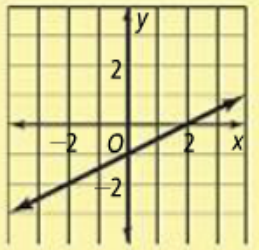


no solution

Solve each system by graphing. Tell whether the system has *one solution, infinitely many solutions,* or *no solution.*

29. $2y = x - 2$
$3y = \frac{3}{2}x - 3$

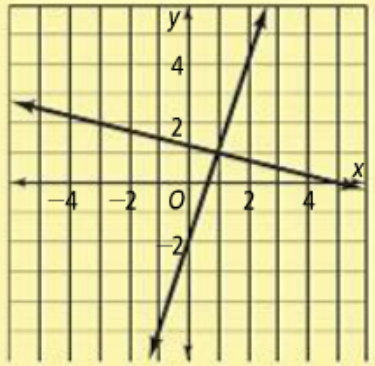
29.



infinitely many solutions

30. $3x - y = 2$
$4y = -x + 5$

30.



one solution: (1, 1)

31. Think About a Plan You are looking for an after-school job. One job pays $9 per hour. Another pays $12 per hour, but you must buy a uniform that costs $39. After how many hours of work would your net earnings from either job be the same?

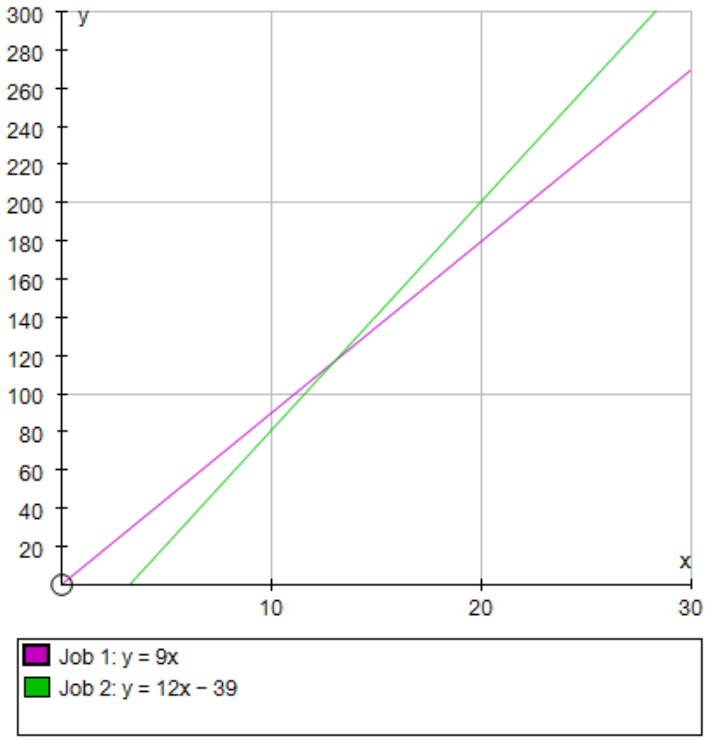
- What equations can you write to model the situation?
- How will graphing the equations help you solve the problem?

31. 13 h

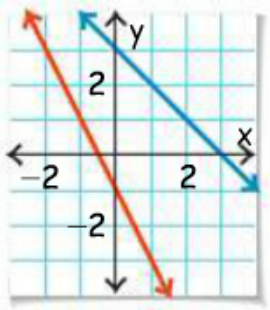
job 1 y = 9x

job 2 y = 12x - 39

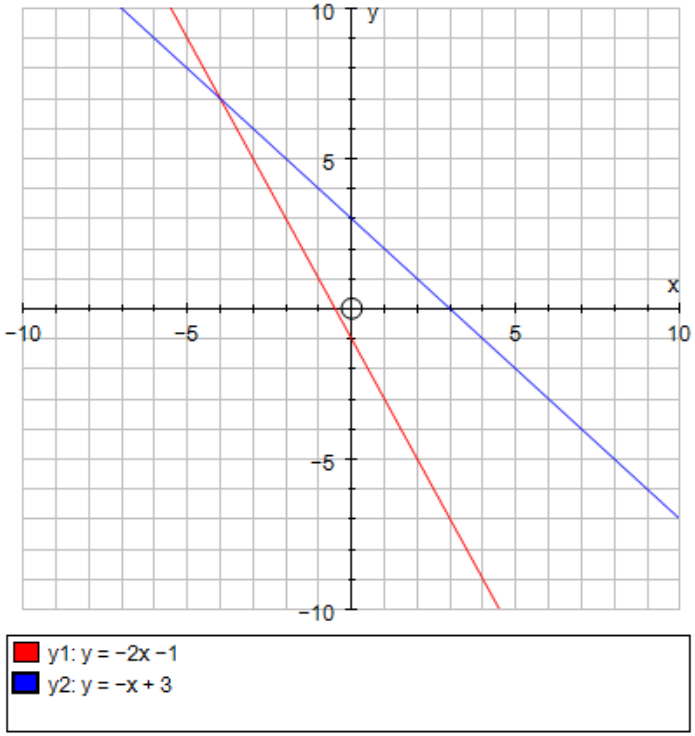
These lines intersect where the number of hours is 13, meaning that at either job you would make the same amount of money.



32. Error Analysis A student graphs the system $y = -x + 3$ and $y = -2x - 1$ as shown at the right. The student concludes there is no solution. Describe and correct the student's error.



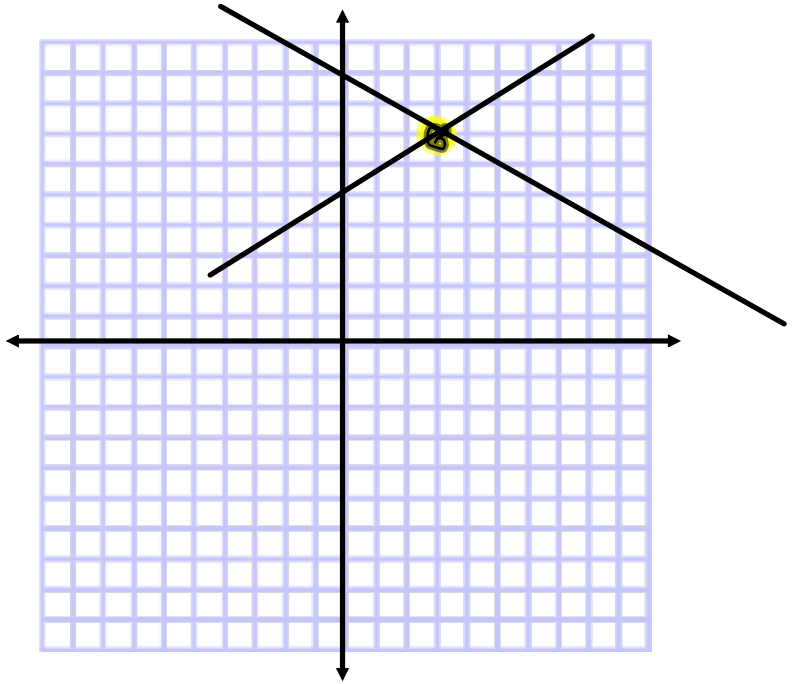
32. The student did not show enough of the graph. If you continue the graph to the left, the lines will intersect at the point (−4, 7).



33. Reasoning Suppose you graph a system of linear equations and the intersection point appears to be (3, 7). Can you be sure that the ordered pair (3, 7) is the solution? What must you do to be sure?

Two or more lines from two or more equations intersect at the point (3, 7).

These are graphs of some equations...



33. You should substitute the values of x and y into both equations to make sure that true statements result.

34. Cell Phone Plans A cell phone provider offers a plan that costs $40 per month plus $.20 per text message sent or received. A comparable plan costs $60 per month but offers unlimited text messaging.

a. How many text messages would you have to send or receive in order for the plans to cost the same each month?

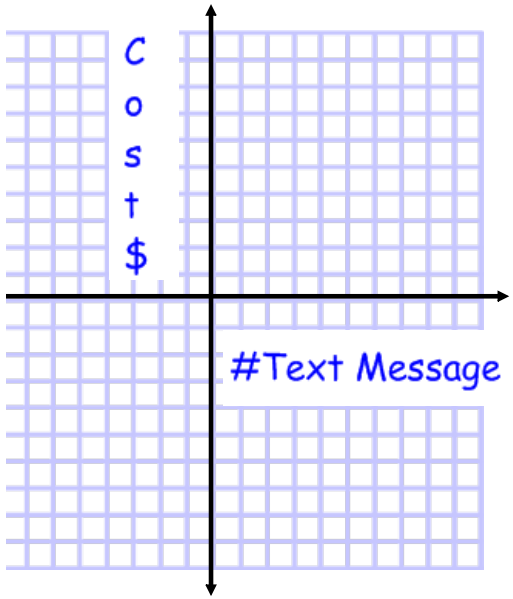
b. If you send or receive an average of 50 text messages each month, which plan would you choose? Why?

Plan one

y = 0.20m + 40 where m is the number of txt msg

Plan two

y = 60 no per text message free - just a flat $60 per month.



a. Draw the graph a see where the lines intersect;

b. look at what the cost is of each plan at 50 messages

34. a. 100 messages

b. the plan that costs $40 per month and $.20 per text message

Without graphing, decide whether each system has *one solution, infinitely many solutions,* or *no solution.* Justify your answer.

Don't graph - but you can put them in slope-intercept form: $y = mx + b$

35. $y = x - 4$
$y = x - 3$

35. No solution; the lines have the same slope and different *y*-intercepts so they are parallel.

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

36. Infinitely many solutions; the lines are the same.

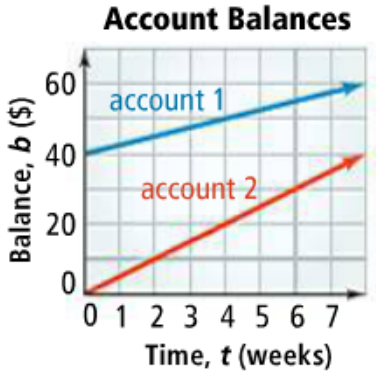
37. $y = 5x - 1$
$10x = 2y + 2$

37. Infinitely many solutions; the lines are the same.

38. $3x + 2y = 1$
$4y = 6x + 2$

38. One solution; the lines have different slopes so they intersect.

39. **Banking** The graph at the right shows the balances in two bank accounts over time. Use the graph to write a system of equations giving the amount in each account over time. Let t = the time in weeks and let b = the balance in dollars. If the accounts continue to grow as shown, when will they have the same balance?



39. $b = 2.5t + 40$
$b = 5t$; 16 weeks

40. Open-Ended One equation in a system is $y = \frac{1}{2}x - 2$.

a. Write a second equation so that the system has one solution.

b. Write a second equation so that the system has no solution.

c. Write a second equation so that the system has infinitely many solutions.

40. a. Answers may vary. Sample: $y = 2x + 8$

any equation with a different slope will intersect at one point

b. Answers may vary: Sample: $y = \frac{1}{2}x + 7$

any equation with the same slope, different y-intercept

c. Answers may vary: Sample: $2y = x - 4$

any equation with the same slope, same y-intercept - the equations would represent the same lines, and if you drew them one on top of another they would intersect at an infinite number of points.

Challenge

41. Reasoning Consider the system at the right.

$$y = gx + 3$$
$$y = hx + 7$$

a. If $g \geq h$, will the system *always, sometimes,* or *never* have exactly one solution? Explain your reasoning.

41. a. Sometimes; if $g > h$, the lines intersect at one point, but if $g = h$, the lines never intersect.

b. If $g \leq h$, will the system *always, sometimes,* or *never* have infinitely many solutions? Explain your reasoning.

b. Never; if $g < h$, the lines intersect at one point, but if $g = h$, the lines never intersect.

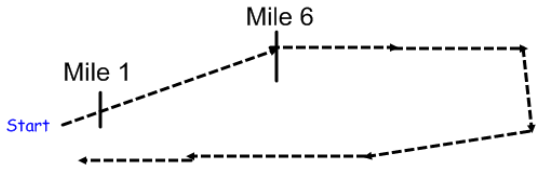
Select different values for g and h
and see what happens

42. Hiking Two hikers are walking along a marked trail. The first hiker starts at a point 6 mi from the beginning of the trail and walks at a speed of 4 mi/h. At the same time, the second hiker starts 1 mi from the beginning and walks at a speed of 3 mi/h.

a. What is a system of equations that models the situation?

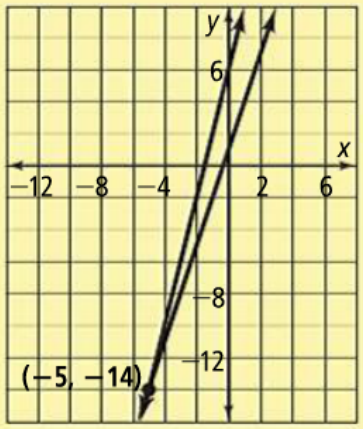
b. Graph the two equations and find the intersection point.

c. Is the intersection point meaningful in this situation? Explain.



42. a. $y = 4x + 6$
$y = 3x + 1$
where x is the number of hours hiking and y is the distance from the beginning of the trail

b. $(-5, -14)$



c. No; -14 represents 14 mi before the beginning of the trail.

The first hiker has a head start and hikes faster than the second hiker. The second hike will not catch up to the first hiker anywhere on the trail.

Standardized Test Prep

43. Which ordered pair is the solution of the system?

$$2x + 3y = -17$$
$$3x + 2y = -8$$

(A) $(2, -7)$ (B) $(-4, 2)$ (C) $(-2, -1)$ (D) $\left(-\frac{4}{3}, -2\right)$

43. A

44. Which expression is equivalent to $5(m - 12) + 8$? = 5m - 60 + 8 = 5m - 52

(F) $5m - 68$ (G) $5m - 20$ (H) $5m - 4$ (I) $5m - 52$

44. I

45. The costs for parking in two different parking garages are given in the table at the right.

a. What is a system of equations that models the situation?
b. How many hours of parking would cost the same parking in either garage?
c. If you needed to park a car for 3 h, which garage would you choose? Why?

Garage Parking Fees

Garage	Flat Fee	Hourly Fee
A	$5	$2.50
B	$20	$0

a. $C = 20$
$C = 2.5h + 5$

b. 6 h

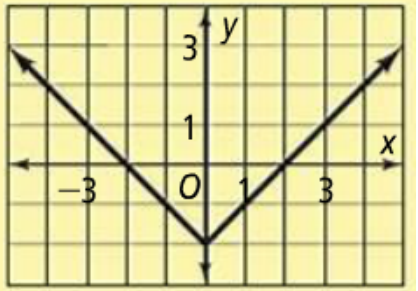
c. Garage A; it costs less for the time given.

Mixed Review

Graph each function by translating the graph of $y = |x|$.

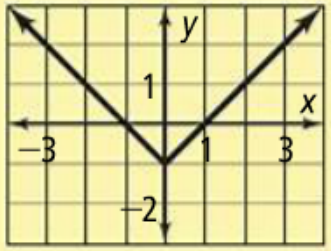
46. $y = |x| - 2$

46.



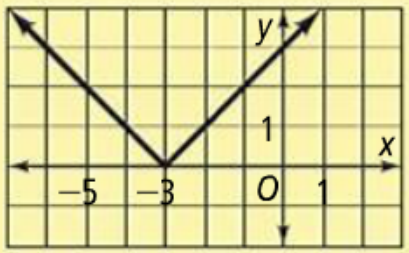
47. $y = |x| - 1$

47.



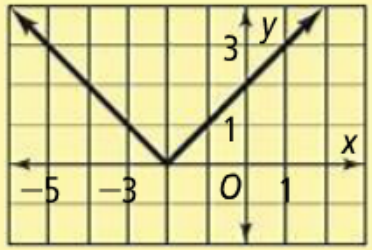
48. $y = |x + 3|$

48.



49. $y = |x + 2|$

49.



Find the slope of a line that is parallel to the graph of the equation.

50. $y = x + 3$

51. $y = -\frac{1}{2}x - 4$

50. 1

51. $-\frac{1}{2}$

52. $3y + 2x = 7$

53. $3x = 5y + 10$

52. $-\frac{2}{3}$

53. $\frac{3}{5}$

Two lines that are parallel will have the same slope. Put but equation in slope-intercept form as needed to help you identify the slope: y = mx + b

Get Ready! **To prepare for Lesson 6-2, do Exercises 54–57.**

Solve each equation for y.

54. $4x + 2y = 38$

54. $y = -2x + 19$

55. $\frac{1}{2}x + \frac{1}{3}y = 5$

55. $y = -\frac{3}{2}x + 15$

56. $\frac{3}{2}y = \frac{4}{5}x$

56. $y = \frac{8}{15}x$

57. $1.5x - 4.5y = 21$

57. $y = \frac{1}{3}x - \frac{14}{3}$