5.5 Solving equations by graphing.

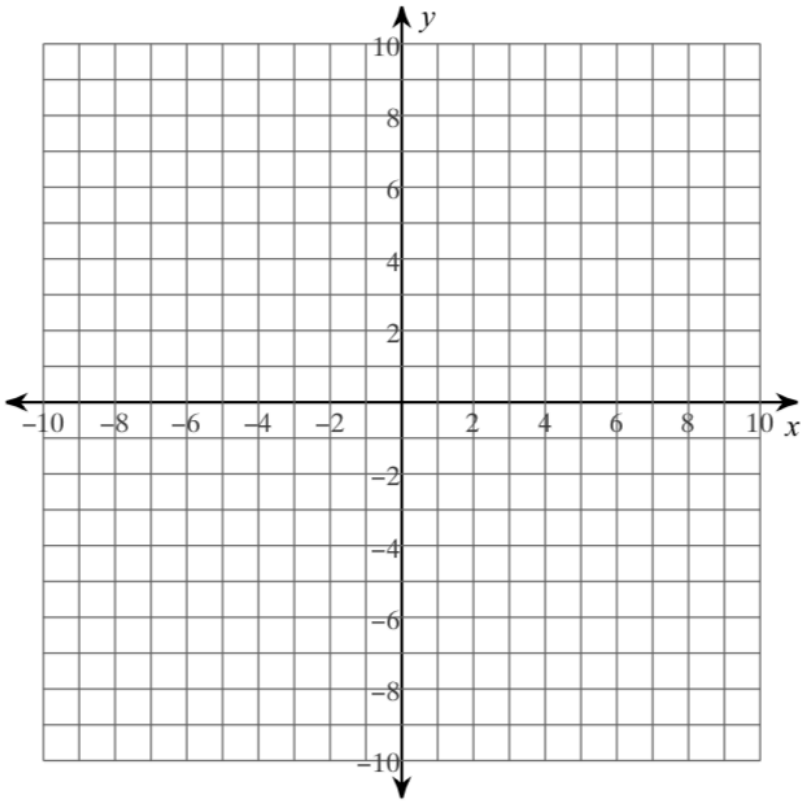
Look at the equation $-x + 1 = 2x - 5$.

What do you notice?

Can you rewrite them in anyway?

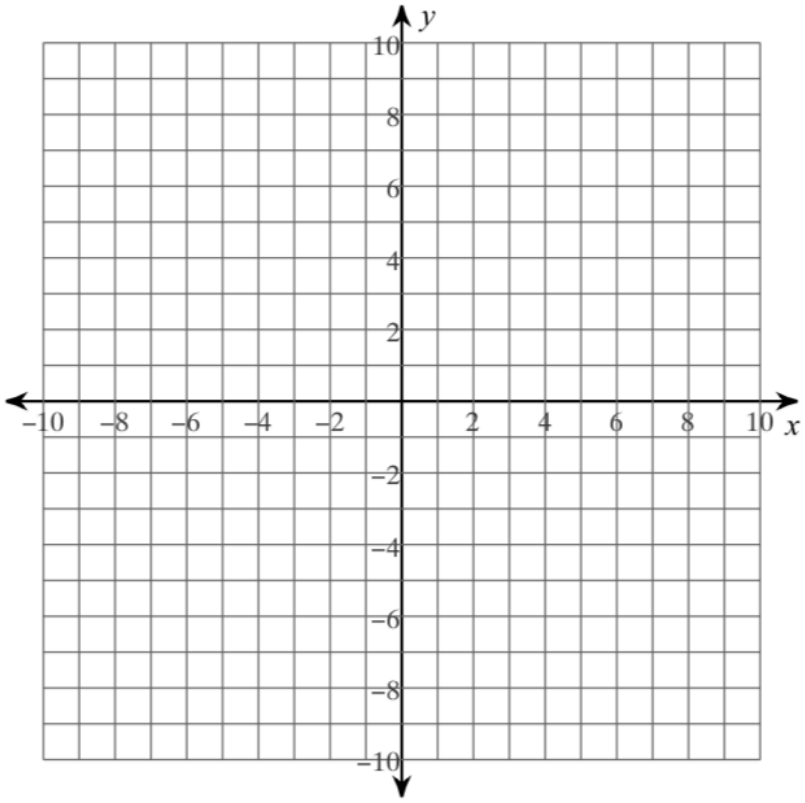
Example 1: Solving an equation by graphing

Solve $-x + 1 = 2x - 5$ by graphing.



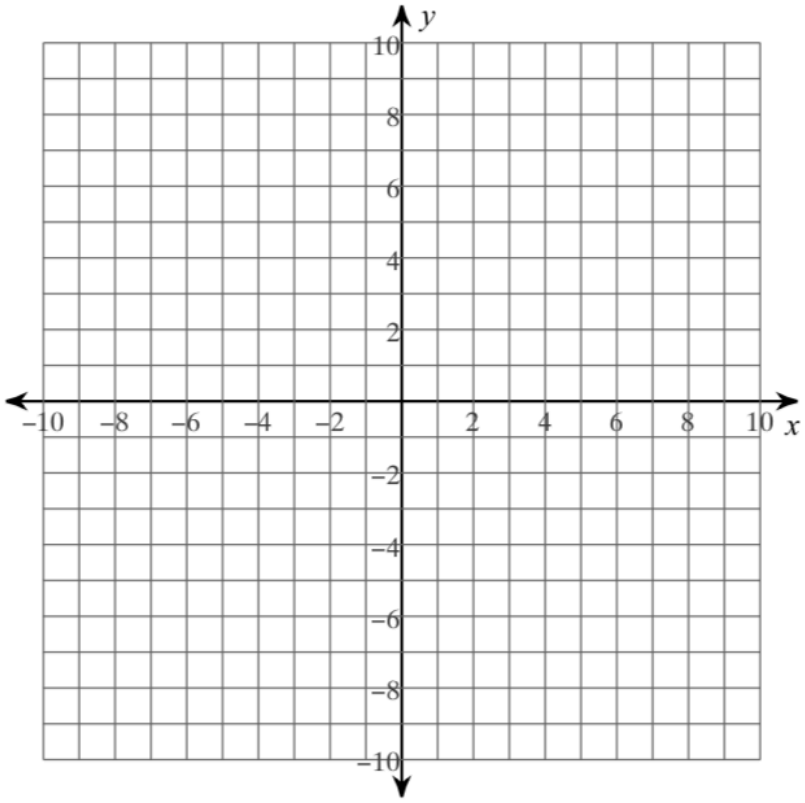
Try on your own.

Solve $-4 + 9x = -3x + 2$ by graphing



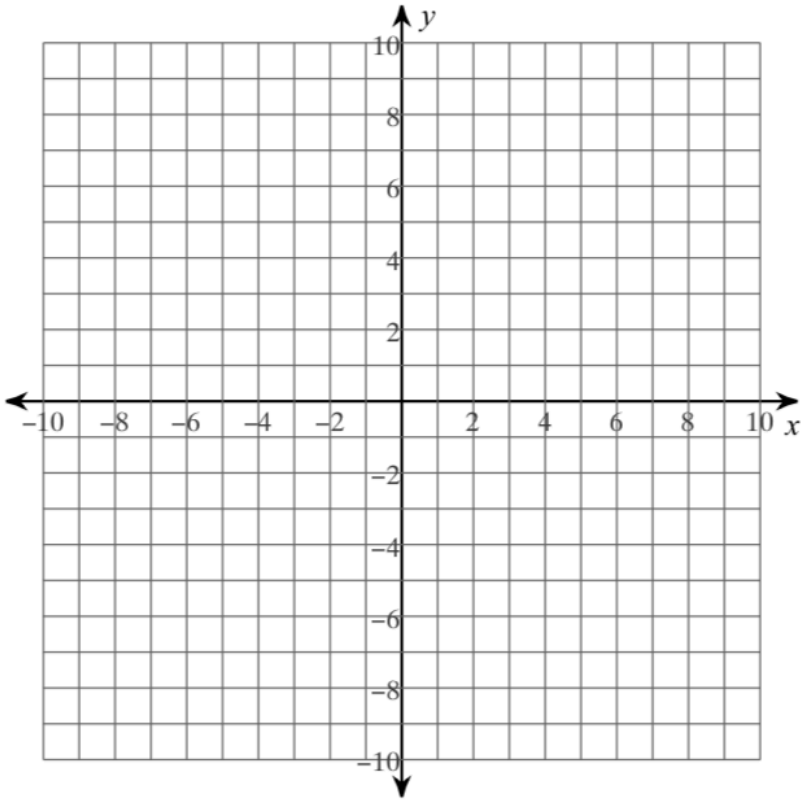
Example 2: Solving absolute value equations by graphing

Solve $|x + 1| = |2x - 4|$



Try on your own.

Solve $|2x + 2| = |x - 2|$



Example 3: Modeling with mathematics.

The Figol family needs to rent a car for a week while on vacation.
Company A charges $3.25 per mile plus a flat tire fee of $125 per week.
Company B charges $3 per mile plus a flat tire fee of $150 per week.
After how many miles of travel are the total costs the same for both companies?
(Uber and Lyft are currently unavailable)

Classwork/Homework
7-13odd, 16, 20, 23, 26, 28, 33, 34, 39

5.5 Exercises

Dynamic Solutions available at *BigIdeasMath.com*

Vocabulary and Core Concept Check

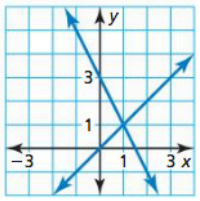
1. **REASONING** The graphs of the equations $y = 3x - 20$ and $y = -2x + 10$ intersect at the point $(6, -2)$. Without solving, find the solution of the equation $3x - 20 = -2x + 10$.

2. **WRITING** Explain how to rewrite the absolute value equation $|2x - 4| = |-5x + 1|$ as two systems of linear equations.

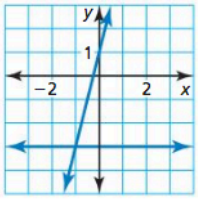
Monitoring Progress and Modeling with Mathematics

In Exercises 3–6, use the graph to solve the equation. Check your solution.

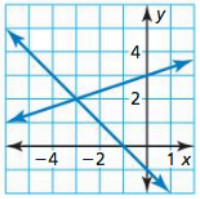
3. $-2x + 3 = x$



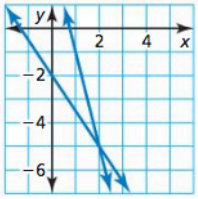
4. $-3 = 4x + 1$



5. $-x - 1 = \frac{1}{3}x + 3$



6. $-\frac{3}{2}x - 2 = -4x + 3$



In Exercises 7–14, solve the equation by graphing. Check your solution. *(See Example 1.)*

7. $x + 4 = -x$

8. $4x = x + 3$

9. $x + 5 = -2x - 4$

10. $-2x + 6 = 5x - 1$

11. $\frac{1}{2}x - 2 = 9 - 5x$

12. $-5 + \frac{1}{4}x = 3x + 6$

13. $5x - 7 = 2(x + 1)$

14. $-6(x + 4) = -3x - 6$

In Exercises 15–20, solve the equation by graphing. Determine whether the equation has *one solution*, *no solution*, or *infinitely many solutions*.

15. $3x - 1 = -x + 7$

16. $5x - 4 = 5x + 1$

17. $-4(2 - x) = 4x - 8$

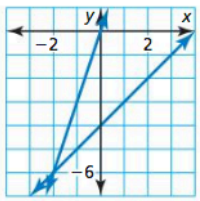
18. $-2x - 3 = 2(x - 2)$

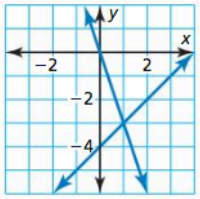
19. $-x - 5 = -\frac{1}{3}(3x + 5)$

20. $\frac{1}{2}(8x + 3) = 4x + \frac{3}{2}$

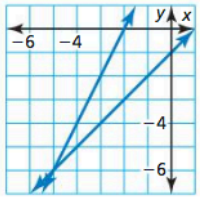
In Exercises 21 and 22, use the graphs to solve the equation. Check your solutions.

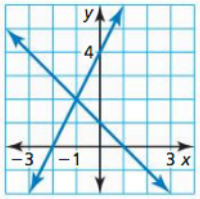
21. $|x - 4| = |3x|$





22. $|2x + 4| = |x - 1|$





In Exercises 23–30, solve the equation by graphing. Check your solutions. *(See Example 2.)*

23. $|2x| = |x + 3|$

24. $|2x - 6| = |x|$

25. $|-x + 4| = |2x - 2|$

26. $|x + 2| = |-3x + 6|$

27. $|x + 1| = |x - 5|$

28. $|2x + 5| = |-2x + 1|$

29. $|x - 3| = 2|x|$

30. $4|x + 2| = |2x + 7|$

USING TOOLS **In Exercises 31 and 32, use a graphing calculator to solve the equation.**

31. $0.7x + 0.5 = -0.2x - 1.3$

32. $2.1x + 0.6 = -1.4x + 6.9$

33. MODELING WITH MATHEMATICS You need to hire a catering company to serve meals to guests at a wedding reception. Company A charges \$500 plus \$20 per guest. Company B charges \$800 plus \$16 per guest. For how many guests are the total costs the same at both companies? *(See Example 3.)*

34. MODELING WITH MATHEMATICS Your dog is 16 years old in dog years. Your cat is 28 years old in cat years. For every human year, your dog ages by 7 dog years and your cat ages by 4 cat years. In how many human years will both pets be the same age in their respective types of years?

35. MODELING WITH MATHEMATICS You and a friend race across a field to a fence and back. Your friend has a 50-meter head start. The equations shown represent you and your friend's distances d (in meters) from the fence t seconds after the race begins. Find the time at which you catch up to your friend.

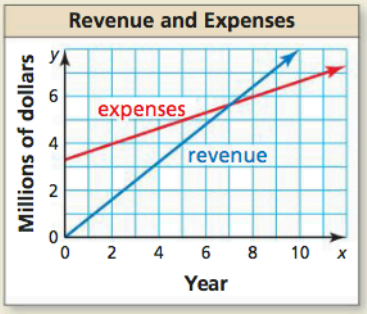
You: $d = |-5t + 100|$

Your friend: $d = \left|-3\frac{1}{3}t + 50\right|$

36. MAKING AN ARGUMENT The graphs of $y = -x + 4$ and $y = 2x - 8$ intersect at the point $(4, 0)$. So, your friend says the solution of the equation $-x + 4 = 2x - 8$ is $(4, 0)$. Is your friend correct? Explain.

37. OPEN-ENDED Find values for m and b so that the solution of the equation $mx + b = -2x - 1$ is $x = -3$.

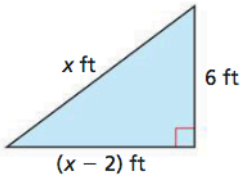
38. HOW DO YOU SEE IT? The graph shows the total revenue and expenses of a company x years after it opens for business.



a. Estimate the point of intersection of the graphs.

b. Interpret your answer in part (a).

39. MATHEMATICAL CONNECTIONS The value of the perimeter of the triangle (in feet) is equal to the value of the area of the triangle (in square feet). Use a graph to find x.



40. THOUGHT PROVOKING A car has an initial value of \$20,000 and decreases in value at a rate of \$1500 per year. Describe a different car that will be worth the same amount as this car in exactly 5 years. Specify the initial value and the rate at which the value decreases.

41. ABSTRACT REASONING Use a graph to determine the sign of the solution of the equation $ax + b = cx + d$ in each situation.

a. $0 < b < d$ and $a < c$ **b.** $d < b < 0$ and $a < c$

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Graph the inequality. *(Section 2.1)*

42. $y > 5$ **43.** $x \leq -2$ **44.** $n \geq 9$ **45.** $c < -6$

Use the graphs of f and g to describe the transformation from the graph of f to the graph of g. *(Section 3.6)*

46. $f(x) = x - 5$; $g(x) = f(x + 2)$

47. $f(x) = 6x$; $g(x) = -f(x)$

48. $f(x) = -2x + 1$; $g(x) = f(4x)$

49. $f(x) = \frac{1}{2}x - 2$; $g(x) = f(x - 1)$