LESSON MAKER PRO

Where Graphs Meet

Find the x-values that make two functions equal.

HIGH SCHOOL · A-REI.11

A-REI.11 "Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions..."

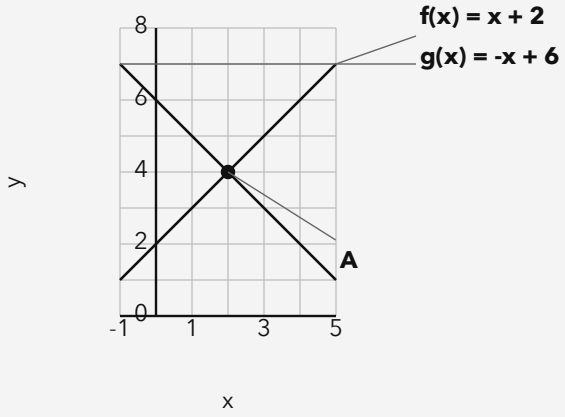
NAME _____ DATE _____

THE BIG IDEA

At an intersection, two graphs have the same y-value. That means the intersection's x-coordinate solves f(x) = g(x). If the x-coordinate is not easy to read, compare the function values in a table to narrow down where they are equal.

WORKED EXAMPLE

Use the graph to find the x-coordinate where f(x) = g(x). Check your answer using both equations.

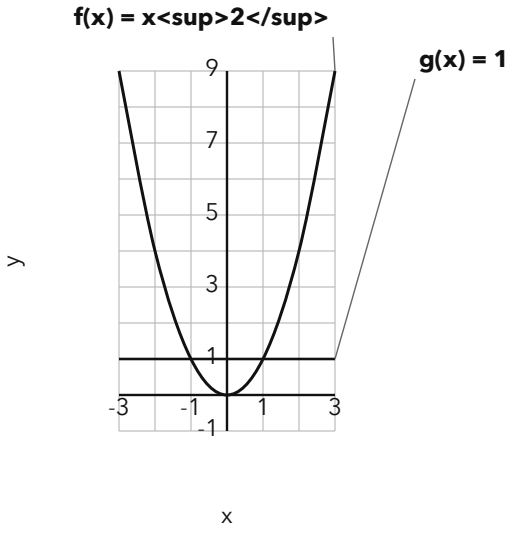


1. Read the intersection: A is (2, 4).
2. Check f(2) = 2 + 2 = 4.
3. Check g(2) = -2 + 6 = 4.

Answer: x = 2, because both functions equal 4 there.

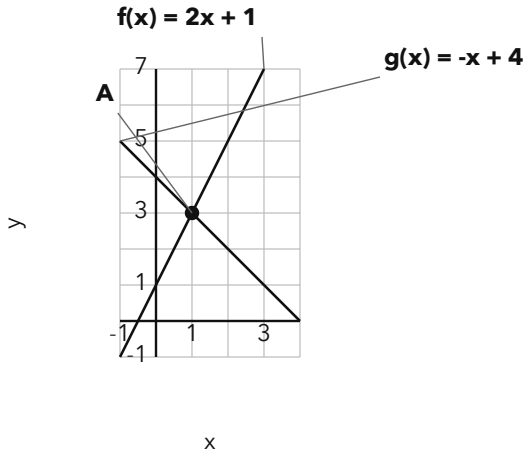
PRACTICE 6 problems

1 Use the graph to find both x-coordinates where f(x) = g(x).



ANSWER _____

2 Use the graph to find the x-coordinate where f(x) = g(x). What is the common y-value?



ANSWER _____

3 Find both x-coordinates where y = |x - 1| and y = 3 intersect.

ANSWER _____

4 For integer x-values from 0 through 4, find where $y = 2^x$ and y = x + 5 intersect. Give the x-coordinate and the common y-value.

ANSWER _____

5 Use the table to estimate the positive x-coordinate where $y = x^2$ and y = 2 intersect. Round to the nearest tenth.

COMPARING FUNCTION VALUES

x	x^2	2
1.40	1.9600	2
1.45	2.1025	2
1.50	2.2500	2

ANSWER _____

6 Find both x-coordinates where $y = x^2 + 1$ and y = 4x - 2 intersect.

ANSWER _____

APPLY IT Show your work

1 Two ride apps charge different fares. App A charges $5 plus $3 per mile. App B charges $2 plus $4 per mile. At how many miles do the fares match, and what is that fare?

WORK SPACE

ANSWER _____

2 In an online game, the bonus for week 0 is 20 coins. Each week's bonus is double the previous week's bonus. A special item costs 160 coins. In which week does that week's bonus match the item's cost?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $|x + 1| = 3 - x$. Explain why these two graphs have only one intersection, even though an absolute value graph has two arms.

WORK SPACE AND ANSWER

ANSWER KEY

Where Graphs Meet

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the graph to find both x-coordinates where f(x) = g(x).	**x = -1 and x = 1**
2	Use the graph to find the x-coordinate where f(x) = g(x). What is the common y-value?	**x = 1; the common y-value is 3.**
3	Find both x-coordinates where y = |x - 1| and y = 3 intersect.	**x = -2 and x = 4**
4	For integer x-values from 0 through 4, find where $y = 2^x$ and y = x + 5 intersect. Give the x-coordinate and the common y-value.	**x = 3; the common y-value is 8.**
5	Use the table to estimate the positive x-coordinate where $y = x^2$ and y = 2 intersect. Round to the nearest tenth.	**x ≈ 1.4**
6	Find both x-coordinates where $y = x^2 + 1$ and y = 4x - 2 intersect.	**x = 1 and x = 3**

PART 2 · APPLY IT

1. **3 miles; $14** Set 5 + 3x = 2 + 4x to get x = 3. Both fares are $14.
2. **Week 3** Set $20 \cdot 2^x = 160$, so $2^x = 8$. Thus x = 3.

CHALLENGE

The only solution is x = 1, where both functions equal 2. For x ≥ -1, x + 1 = 3 - x gives x = 1. For x < -1, the absolute value is -x - 1, which is always 4 less than 3 - x, so that arm has no intersection.

For graph questions, accept the correct x-coordinates with or without ordered pairs. In problem 5, the table places the positive solution between 1.40 and 1.45, so it rounds to 1.4.