LESSON MAKER PRO

Where Graphs Meet

Find solutions at intersections

HIGH SCHOOL · A2S.AF.E.14

A2S.AF.E.14 "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). a. Find the approximate solutions of an equation graphically..."

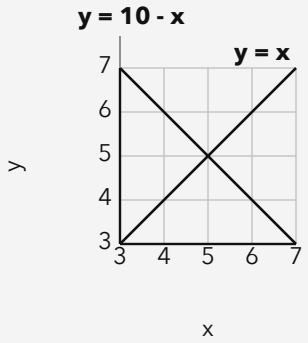
NAME _____ DATE _____

THE BIG IDEA

At an intersection, two graphs have the same x-coordinate and the same y-coordinate. That means their outputs are equal, so the intersection's x-coordinate solves f(x) = g(x).

WORKED EXAMPLE

Where do the lines meet? What equation does that x-coordinate solve?



1. Read the intersection: (5, 5).
2. At x = 5, both outputs are 5.
3. Set the outputs equal: x = 10 - x.

Answer: x = 5 solves x = 10 - x.

PRACTICE 4 problems

1 Find the intersection x-coordinate for y = x + 7 and y = 15 - x.

ANSWER _____

2 Find both intersection x-coordinates for y = x^2 and y = 36.

ANSWER _____

3 Find the intersection x-coordinate for y = √(x + 1) and y = x - 1.

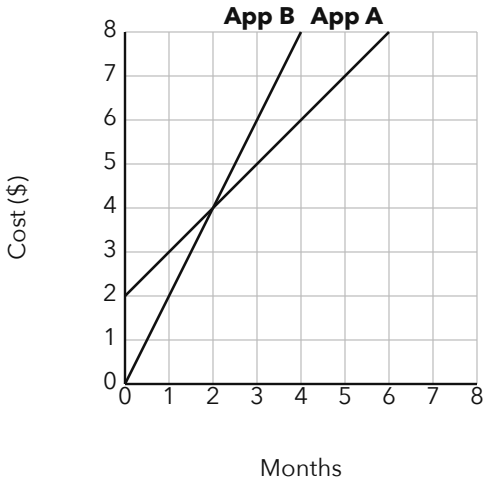
ANSWER _____

4 For 0 ≤ x ≤ 2π, find both intersection x-coordinates for y = cos(x) and y = 0.

ANSWER _____

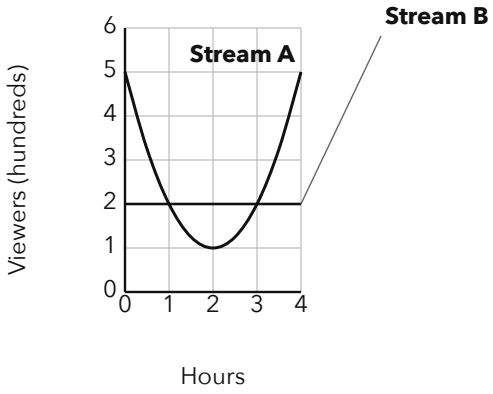
APPLY IT Show your work

1 Two music apps charge for x months. Use the graph to find when their total costs match and what each costs then.



ANSWER _____

2 Two livestreams track viewers after x hours. The graph shows viewers in hundreds. At which hours do they have the same number of viewers?



ANSWER _____

CHALLENGE One step up

For $0 \le x < 3$, $f(x) = x + 2$. For $3 \le x \le 6$, $f(x) = 8 - x$. Let $g(x) = 4$. Find every solution to $f(x) = g(x)$. Explain why there are no others.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the intersection x-coordinate for $y = x + 7$ and $y = 15 - x$.	**$x = 4$**
2	Find both intersection x-coordinates for $y = x^2$ and $y = 36$.	**$x = -6$ and $x = 6$**
3	Find the intersection x-coordinate for $y = \sqrt{(x + 1)}$ and $y = x - 1$.	**$x = 3$**
4	For $0 \le x \le 2\pi$, find both intersection x-coordinates for $y = \cos(x)$ and $y = 0$.	**$x = \pi/2$ and $x = 3\pi/2$**

PART 2 · APPLY IT

1. **After 2 months, each costs $4.** The graphs intersect at (2, 4), so both apps cost $4 after 2 months.
2. **After 1 hour and after 3 hours.** The graphs intersect at (1, 2) and (3, 2). Both streams have 200 viewers at those times.

CHALLENGE

$x = 2$ and $x = 4$. Each value satisfies its branch of $f(x)$. Each linear branch equals 4 only once, so there are no other solutions.

Accept x-coordinates without ordered pairs unless a problem also asks for a cost. In the challenge, accept any explanation that checks both branches and their domains.