LESSON MAKER PRO

Curve Crossing Quest

Find where lines and curves meet.

HIGH SCHOOL · HSA-REI.C.7

CCSS.Math.Content.HSA-REI.C.7 "Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = -3 x and the circle x 2 + y 2 = 3."

NAME _____ DATE _____

FIND THE SHARED POINTS

A solution to a system is a point that makes both equations true. Substitute the linear expression for y into the quadratic equation, solve for x, and use the line to find y. A graph checks that these ordered pairs are where the line and curve meet.

WORKED EXAMPLE

Solve the system algebraically. Then check on a graph: y = x + 1 and x^2 + y^2 = 5.

1. Substitute y = x + 1: x^2 + (x + 1)^2 = 5.
2. Simplify: 2x^2 + 2x - 4 = 0, so x^2 + x - 2 = 0.
3. Factor: (x + 2)(x - 1) = 0, so x = -2 or x = 1.
4. Use y = x + 1: when x = -2, y = -1; when x = 1, y = 2.

Answer: (-2, -1) and (1, 2)

PRACTICE 6 problems

1 Solve algebraically. Then sketch both equations to verify: y = 3x and y = x^2.

ANSWER _____

2 Solve algebraically. Then sketch both equations to verify: y = x and y = (x - 2)^2.

ANSWER _____

3 Solve algebraically. Then sketch both equations to verify: y = -x + 4 and x^2 + y^2 = 10.

ANSWER _____

4 Solve algebraically. Then sketch both equations to verify: y = 2x - 1 and y = x^2.

ANSWER _____

5 Solve algebraically. Then sketch both equations to verify: y = 2x - 2 and x^2 + y^2 = 4.

ANSWER _____

6 Solve algebraically. Then sketch both equations to verify: y = -x and y = x^2 + 4.

ANSWER _____

APPLY IT Show your work

1 An indie game designer models a character's jump path with y = -x^2 + 6x. A floating ramp is modeled by y = 2x + 3. In the coordinate grid, x and y are measured in game units. At which points does the character's path meet the ramp?

WORK SPACE

ANSWER _____

2 For a school video, a drone's flight path is modeled by y = -x^2 + 8x, where x is horizontal distance and y is height in feet. A safety cable is modeled by y = 2x + 8. At which points does the drone's path cross the cable?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve the system algebraically: y = 3x - 4 and x^2 + y^2 = 8. Then explain how your algebra proves the number of intersection points.

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ANSWER KEY

Curve Crossing Quest

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve algebraically. Then sketch both equations to verify: y = 3x and y = x^2.	**(0, 0) and (3, 9)**
2	Solve algebraically. Then sketch both equations to verify: y = x and y = (x - 2)^2.	**(1, 1) and (4, 4)**
3	Solve algebraically. Then sketch both equations to verify: y = -x + 4 and x^2 + y^2 = 10.	**(1, 3) and (3, 1)**
4	Solve algebraically. Then sketch both equations to verify: y = 2x - 1 and y = x^2.	**(1, 1)**
5	Solve algebraically. Then sketch both equations to verify: y = 2x - 2 and x^2 + y^2 = 4.	**(0, -2) and (8/5, 6/5)**
6	Solve algebraically. Then sketch both equations to verify: y = -x and y = x^2 + 4.	**No real solution. The graphs do not intersect.**

PART 2 · APPLY IT

1. **(1, 5) and (3, 9)** Set -x^2 + 6x equal to 2x + 3. This gives x^2 - 4x + 3 = 0, so x = 1 or x = 3; substitute into the ramp equation for y.
2. **(2, 12) and (4, 16)** Set -x^2 + 8x equal to 2x + 8. Factor x^2 - 6x + 8 = 0 to get x = 2 or x = 4, then find each y-value from y = 2x + 8.

CHALLENGE

The intersections are (2, 2) and (2/5, -14/5). Substitution gives 5x^2 - 12x + 4 = 0 = (5x - 2)(x - 2), which has two different roots, so there are exactly two intersections.

Accept equivalent ordered-pair forms, including decimal equivalents only when they are exact. For the no-real-solution item, accept a correct explanation that the resulting quadratic has no real roots or that the graphs do not meet.