LESSON MAKER PRO

Intersection Investigation

Solve where a line and a curve meet.

HIGH SCHOOL · MA.912.AR.9.2

MA.912.AR.9.2 "Given a mathematical or real-world context, solve a system consisting of a two-variable linear equation and a non-linear equation algebraically or graphically."

NAME _____ **DATE** _____

FIND THE SHARED POINTS

A solution to a system is a point that makes both equations true. You can substitute the linear expression into the nonlinear equation, solve for x, and then use either equation to find y. A graph can also show the intersection points.

WORKED EXAMPLE

Solve the system: $y = 5x - 6$ and $y = x^2$

1. Set the y-expressions equal: $x^2 = 5x - 6$.
2. Move all terms to one side: $x^2 - 5x + 6 = 0$.
3. Factor: $(x - 2)(x - 3) = 0$, so $x = 2$ or $x = 3$.
4. Substitute to find y: $x = 2$ gives $y = 4$, and $x = 3$ gives $y = 9$.

Answer: (2, 4) and (3, 9)

PRACTICE 6 problems

1 Solve the system: $y = x + 7$ and $y = x^2 - 49$

ANSWER _____

2 Solve the system: $y = -x + 10$ and $y = x^2 - 100$

ANSWER _____

3 Solve the system: $x + y = 25$ and $x^2 + y^2 = 325$

ANSWER _____

4 Solve the system: $y = -x + 56$ and $y = x^2$

ANSWER _____

5 Solve the system: $y = 15x - 56$ and $y = x^2$

ANSWER _____

6 Solve the system: $y = 7x - 49$ and $y = |x - 15|$

ANSWER _____

APPLY IT Show your work

1 A video tracks a ball and a drone. After x seconds, the ball's height is $y = -x^2 + 25x$ feet. The drone's height is $y = 7x + 80$ feet. At what times are they at the same height, and what is that height?

WORK SPACE

ANSWER _____

2 A student council tests two ticket-demand models for a concert. If x is the discount in dollars, Model A predicts $y = -x^2 + 25x + 100$ tickets sold. Model B predicts $y = 7x + 180$ tickets sold. What discounts give the same predicted number of tickets, and how many tickets are predicted?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve the system. Then explain how you know each solution fits the correct absolute-value case: $y = x/3 + 1$ and $y = |x - 14|$.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve the system: $y = x + 7$ and $y = x^2 - 49$	**(-7, 0) and (8, 15)**
2	Solve the system: $y = -x + 10$ and $y = x^2 - 100$	**(-11, 21) and (10, 0)**
3	Solve the system: $x + y = 25$ and $x^2 + y^2 = 325$	**(10, 15) and (15, 10)**
4	Solve the system: $y = -x + 56$ and $y = x^2$	**(-8, 64) and (7, 49)**
5	Solve the system: $y = 15x - 56$ and $y = x^2$	**(7, 49) and (8, 64)**
6	Solve the system: $y = 7x - 49$ and $y = \|x - 15\|$	**(8, 7)**

PART 2 · APPLY IT

1. **After 8 seconds, both are 136 feet high. After 10 seconds, both are 150 feet high.** Set the height equations equal: $-x^2 + 25x = 7x + 80$. This gives $x^2 - 18x + 80 = 0$, so $x = 8$ or $x = 10$; substitute each time into either height equation.
2. **An $8 discount predicts 236 tickets for both models. A $10 discount predicts 250 tickets for both models.** Set the models equal: $-x^2 + 25x + 100 = 7x + 180$. The resulting equation factors to $x^2 - 18x + 80 = 0$, giving $x = 8$ and $x = 10$; substitute to find y.

CHALLENGE

(39/4, 17/4) and (45/2, 17/2). For $x < 14$, use $|x - 14| = 14 - x$, which gives $x = 39/4$. For $x >= 14$, use $|x - 14| = x - 14$, which gives $x = 45/2$.

Accept solutions written as ordered pairs or as matching x- and y-values. For absolute-value systems, accept only solutions that satisfy the case condition used to find them.