LESSON MAKER PRO

Where Paths Meet

Find values that satisfy two equations at once.

HIGH SCHOOL · A.REI.C.7.a

A.REI.C.7.a "Solve systems of equations comprised of various combinations of all algebraic and transcendental functions in two variables."

NAME _____ DATE _____

SOLVE BY SUBSTITUTION

A solution to a system makes both equations true. When both equations equal y, set their other sides equal, solve for x, and substitute each valid x-value to find y. Check for restrictions, such as a nonzero denominator or a positive logarithm input.

WORKED EXAMPLE

Solve $y = 3x + 11$ and $y = x^2 + 7$.

1. Set the expressions for y equal: $x^2 + 7 = 3x + 11$.
2. Move all terms to one side: $x^2 - 3x - 4 = 0$.
3. Factor: $(x - 4)(x + 1) = 0$, so $x = 4$ or $x = -1$.
4. Substitute into $y = 3x + 11$ to get $y = 23$ or $y = 8$.

Answer: (4, 23) and (-1, 8)

PRACTICE 6 problems

1 Solve the system. Give each solution as an ordered pair: $y = x + 2$ and $y = x^2 - 4$.

ANSWER _____

2 Solve the system. Give each solution as an ordered pair: $y = 2x + 1$ and $y = x^2 + 1$.

ANSWER _____

3 Solve the system. Give each solution as an ordered pair: $y = |x - 2|$ and $y = 2$.

ANSWER _____

4 Find x for the system $y = 3^x$ and $y = 27$.

ANSWER _____

5 Solve the system. Give each solution as an ordered pair: $y = 1/x$ and $y = x$.

ANSWER _____

6 Find x for the system $y = \log_2(x)$ and $y = 3$.

ANSWER _____

APPLY IT Show your work

1 A school club sells sticker packs at an art fair. If each pack costs x dollars, the club expects to sell 30 - 2x packs. The club wants $100 in sales. What possible prices meet that goal, and how many packs would sell at each price?

WORK SPACE

ANSWER _____

2 A video has 600 views at the end of day 0. Its total views double each day. A creator's goal is 4,800 views. Let x be the number of days after day 0. Solve the system $y = 600(2^x)$ and $y = 4{,}800$. When will the video reach the goal?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $y = x^2 - 6$ and $y = 2|x| + 2$. Give every solution as an ordered pair, and explain why there are no others.

WORK SPACE AND ANSWER

Where Paths Meet

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve the system. Give each solution as an ordered pair: $y = x + 2$ and $y = x^2 - 4$.	**(-2, 0) and (3, 5)**
2	Solve the system. Give each solution as an ordered pair: $y = 2x + 1$ and $y = x^2 + 1$.	**(0, 1) and (2, 5)**
3	Solve the system. Give each solution as an ordered pair: $y = \|x - 2\|$ and $y = 2$.	**(0, 2) and (4, 2)**
4	Find x for the system $y = 3^x$ and $y = 27$.	**x = 3**
5	Solve the system. Give each solution as an ordered pair: $y = 1/x$ and $y = x$.	**(-1, -1) and (1, 1)**
6	Find x for the system $y = \log_2(x)$ and $y = 3$.	**x = 8**

PART 2 · APPLY IT

1. **$5 per pack and 20 packs, or $10 per pack and 10 packs.** Set revenue equal to the goal: $x(30 - 2x) = 100$. This gives $(x - 5)(x - 10) = 0$; substitute each price into $30 - 2x$.
2. **After 3 days, at the end of day 3.** Set $600(2^x) = 4{,}800$ and divide by 600 to get $2^x = 8$. Since $2^3 = 8$, $x = 3$.

CHALLENGE

(-4, 10) and (4, 10). Let $t = |x|$, where t is nonnegative. Then $t^2 - 2t - 8 = (t - 4)(t + 2) = 0$. Only $t = 4$ is nonnegative, so $x = -4$ or $x = 4$; both give $y = 10$.

Accept solution pairs in either order. In the challenge, accept any explanation that rules out $|x| = -2$.