LESSON MAKER PRO

Where Graphs Meet

Find and interpret intersections of a line and a parabola.

HIGH SCHOOL · A2.A.1

A2.A.1 "Represent and solve mathematical and real-world problems using nonlinear equations, systems of linear equations, and systems of linear inequalities; interpret the solutions in the original context..."

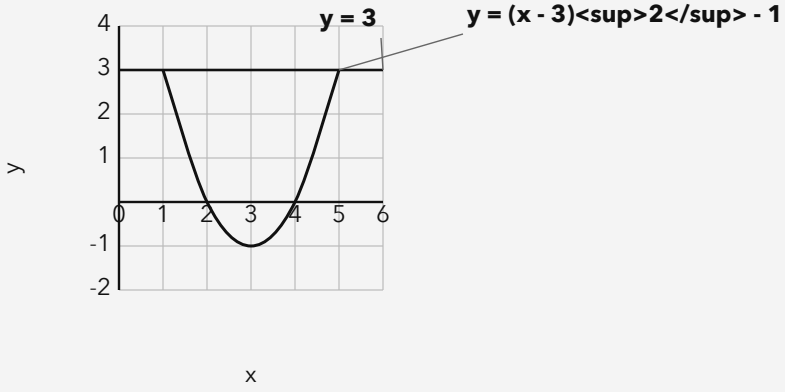
NAME _____ DATE _____

THE BIG IDEA

A line and a parabola meet where their y-values are equal. Set their equations equal, solve for x, and use either equation to find each matching y-value.

WORKED EXAMPLE

Find the intersection points of the two graphs.



1. Set the y-values equal: $(x - 3)^2 - 1 = 3$.
2. Add 1: $(x - 3)^2 = 4$.
3. So $x - 3 = 2$ or $x - 3 = -2$.
4. Solve for x, then use $y = 3$.

Answer: (1, 3) and (5, 3)

PRACTICE 4 problems

1 Find the intersections: $y = x^2 - 9$ and $y = 0$.

ANSWER _____

2 Find the intersections: $y = x^2 - 2x$ and $y = x$.

ANSWER _____

3 Find the intersections: $y = x^2 + 2x + 1$ and $y = 1$.

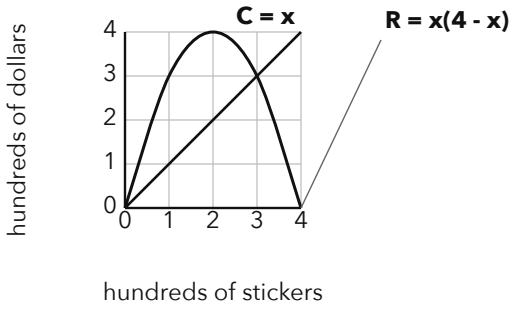
ANSWER _____

4 How many real intersections do $y = x^2 + 4$ and $y = 2$ have?

ANSWER _____

APPLY IT Show your work

1 A sticker shop's revenue R and cost C are graphed. Both axes use hundreds. How many stickers are sold at the positive break-even point?



ANSWER _____

2 A drone's height after t seconds is $h = -t^2 + 4t + 5$ meters. At what times is it 8 meters high?

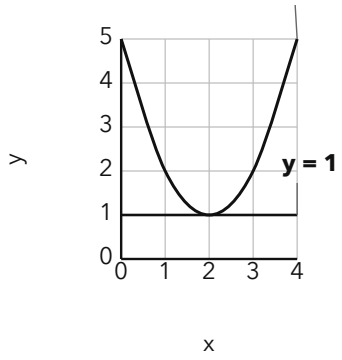
WORK SPACE

ANSWER _____

CHALLENGE One step up

Find the intersection of the graphs. Explain why there is no second intersection.

y = (x - 2)² + 1



WORK SPACE AND ANSWER

ANSWER KEY

Where Graphs Meet

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the intersections: $y = x^2 - 9$ and $y = 0$.	**(-3, 0) and (3, 0)**
2	Find the intersections: $y = x^2 - 2x$ and $y = x$.	**(0, 0) and (3, 3)**
3	Find the intersections: $y = x^2 + 2x + 1$ and $y = 1$.	**(-2, 1) and (0, 1)**
4	How many real intersections do $y = x^2 + 4$ and $y = 2$ have?	**0**

PART 2 · APPLY IT

1. **300 stickers** At the positive intersection, $x = 3$. Since x counts hundreds of stickers, that is 300 stickers.
2. **1 second and 3 seconds** Set $-t^2 + 4t + 5 = 8$. Rearranging gives $(t - 1)(t - 3) = 0$.

CHALLENGE

(2, 1). Setting the equations equal gives $(x - 2)^2 = 0$, which has only one x-value.

Accept intersection points in either order. In the challenge, accept an explanation that the line touches the parabola at its lowest point.