LESSON MAKER PRO

Parabola Clues

Use zeros, vertices, and end behavior to read quadratic graphs.

HIGH SCHOOL · A2S.AF.H.20

A2S.AF.H.20 "Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Extend to polynomial, trigonometric (sine and cosine), logarithmic, reciprocal, radical..."

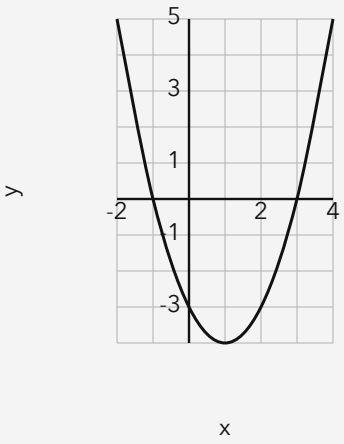
NAME _____ DATE _____

FIND THE FEATURES

For y = a(x - r)(x - s), the zeros are r and s. The vertex lies halfway between the zeros; substitute its x-value to find its y-value. Both ends rise when a is positive and fall when a is negative.

WORKED EXAMPLE

Use the graph of y = (x + 1)(x - 3) to find the zeros and vertex. What happens at both ends?



1. Set each factor to zero: x = -1 or x = 3.
2. Halfway between -1 and 3 is x = 1.
3. Substitute x = 1: y = (2)(-2) = -4.
4. The leading coefficient is positive, so both ends rise.

Answer: Zeros: -1 and 3. Vertex: (1, -4). Both ends rise.

PRACTICE 4 problems

1 For y = (x - 2)(x - 4), find the zeros and vertex.

ANSWER _____

2 For y = -(x + 2)(x + 4), find the zeros and vertex.

ANSWER _____

3 For y = x(x + 5), find the zeros. Do both ends rise or fall?

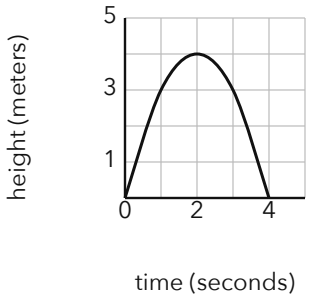
ANSWER _____

4 For y = -2(x - 1)(x - 5), find the zeros. Do both ends rise or fall?

ANSWER _____

APPLY IT Show your work

1 A ball's height is $h(t) = -(t - 2)^2 + 4$ for $0 \le t \le 4$. On the graph, when is the ball highest, and when does it land?



ANSWER _____

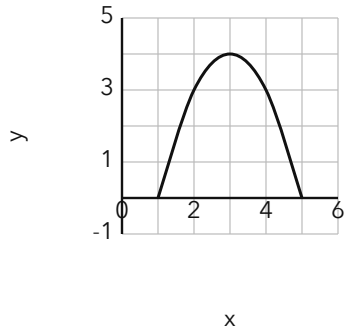
2 A club models profit p(x), in hundreds of dollars, at ticket price x dollars by $p(x) = -(x - 4)^2 + 4$. Which prices give zero profit? Which price gives the most profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The graph shows $y = a(x - 1)(x - 5)$. Find a. Then tell whether both ends rise or fall.



WORK SPACE AND ANSWER

ANSWER KEY

Parabola Clues

HIGH SCHOOL · A2S.AF.H.20

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For y = (x - 2)(x - 4), find the zeros and vertex.	**Zeros: 2 and 4. Vertex: (3, -1).**
2	For y = -(x + 2)(x + 4), find the zeros and vertex.	**Zeros: -2 and -4. Vertex: (-3, 1).**
3	For y = x(x + 5), find the zeros. Do both ends rise or fall?	**Zeros: -5 and 0. Both ends rise.**
4	For y = -2(x - 1)(x - 5), find the zeros. Do both ends rise or fall?	**Zeros: 1 and 5. Both ends fall.**

PART 2 · APPLY IT

1. **Highest at 2 seconds; lands at 4 seconds.** Read the vertex at (2, 4) and the later t-intercept at (4, 0).
2. **Zero profit at $2 and $6; most profit at $4.** Set $p(x) = 0$ to get $(x - 4)^2 = 4$, so $x = 2$ or 6. The vertex occurs at $x = 4$.

CHALLENGE

a = -1; both ends fall.

Accept zeros in either order. In the challenge, substituting (3, 4) gives $4 = a(2)(-2)$, so $a = -1$.