LESSON MAKER PRO

Polynomial Peaks

Sketch graphs using zeros, turning points, and end behavior.

HIGH SCHOOL · MT.PLUS.ALG.POLY.3

MT.PLUS.ALG.POLY.3 "Graph polynomial functions with and without the use of technology, by identifying zeros, relative maxima and minima, and end behavior."

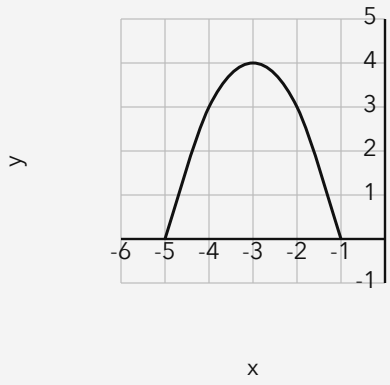
NAME _____ DATE _____

GRAPH CLUES

Zeros are where a graph meets the x-axis. A quadratic's vertex is its relative maximum or minimum. If the x^2 term is positive, both ends rise; if it is negative, both ends fall.

WORKED EXAMPLE

Use the quadratic graph to find its zeros and relative maximum. Which way do both ends go?



1. Read the x-intercepts: x = -5 and x = -1.
2. Read the highest point: (-3, 4).
3. The quadratic opens downward, so both ends fall.

Answer: Zeros: -5 and -1; relative maximum: (-3, 4); both ends fall.

PRACTICE 4 problems

1 Sketch y = (x + 2)(x - 2). Mark the zeros and vertex. Add end arrows.

ANSWER _____

2 Sketch y = -(x - 1)(x - 5). Mark the zeros and vertex. Add end arrows.

ANSWER _____

3 Sketch $y = (x + 1)^2 - 9$. Mark the zeros and vertex. Add end arrows.

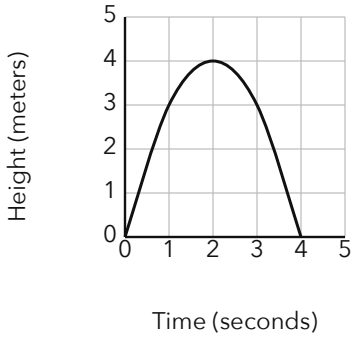
ANSWER _____

4 Sketch $y = -(x - 4)^2 + 1$. Mark the zeros and vertex. Add end arrows.

ANSWER _____

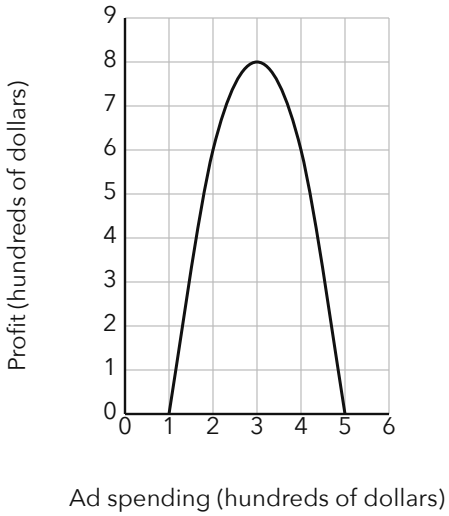
APPLY IT Show your work

1 A kicked ball's height is graphed against time. When is it highest, and when does it land?



ANSWER _____

2 An online shop graphs daily profit against ad spending. How much should it spend to reach the greatest profit, and what is that profit?



ANSWER _____

CHALLENGE One step up

Sketch $y = (x + 1)(x - 2)^2$. At which zero does the graph touch the x-axis without crossing it? Explain using the factors, and show both end arrows.

WORK SPACE AND ANSWER

ANSWER KEY

Polynomial Peaks

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch $y = (x + 2)(x - 2)$. Mark the zeros and vertex. Add end arrows.	**Zeros: -2 and 2; relative minimum: (0, -4); both ends rise.**
2	Sketch $y = -(x - 1)(x - 5)$. Mark the zeros and vertex. Add end arrows.	**Zeros: 1 and 5; relative maximum: (3, 4); both ends fall.**
3	Sketch $y = (x + 1)^2 - 9$. Mark the zeros and vertex. Add end arrows.	**Zeros: -4 and 2; relative minimum: (-1, -9); both ends rise.**
4	Sketch $y = -(x - 4)^2 + 1$. Mark the zeros and vertex. Add end arrows.	**Zeros: 3 and 5; relative maximum: (4, 1); both ends fall.**

PART 2 · APPLY IT

1. **Highest at 2 seconds; lands at 4 seconds.** Read the vertex for the highest point. The later x-intercept gives the landing time.
2. **Spend $300 for a greatest profit of $800.** The vertex is (3, 8). Each coordinate represents hundreds of dollars.

CHALLENGE

The graph crosses at x = -1 and touches without crossing at x = 2 because (x - 2) is squared. The left end falls and the right end rises.

Accept any clear freehand sketch with the stated zeros, turning point, and end directions. In the challenge, the graph has a relative minimum at (2, 0).