LESSON MAKER PRO

Feature Finder

Graph functions and describe their key features.

HIGH SCHOOL · AII-F.IF.7

AII-F.IF.7 "Graph functions and show key features of the graph by hand and using technology when appropriate."

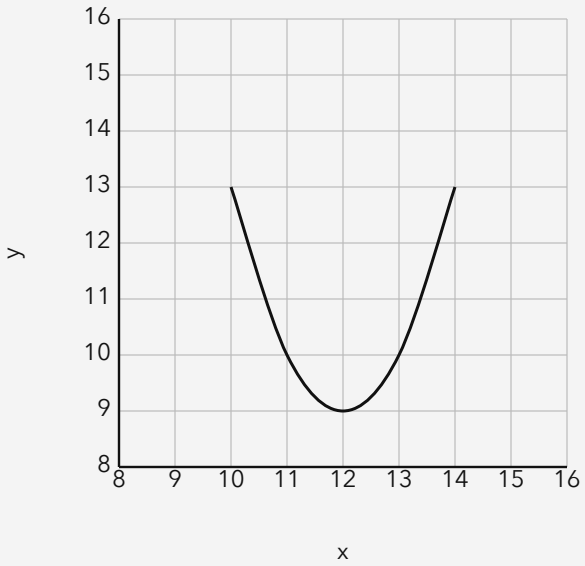
NAME _____ DATE _____

GRAPH FEATURES

For $y = a(x - h)^2 + k$, the vertex is (h, k) and the axis of symmetry is x = h. If a is positive, the vertex is a minimum. If a is negative, the vertex is a maximum.

WORKED EXAMPLE

Use the graph. State the vertex, axis of symmetry, and minimum value.



1. Find the lowest point on the curve: (12, 9).
2. The vertical line through the vertex is x = 12.
3. The curve opens up, so its minimum y-value is 9.

Answer: Vertex: (12, 9); axis of symmetry: x = 12; minimum value: 9.

PRACTICE 4 problems

1 For $y = (x + 2)^2 + 3$, state the vertex and axis of symmetry.

ANSWER _____

_____

2 For $y = -(x - 4)^2 + 5$, state the maximum value and range.

ANSWER _____

_____

3 For $f(x) = |x - 1| - 6$, state the vertex and y-intercept.

ANSWER _____

_____

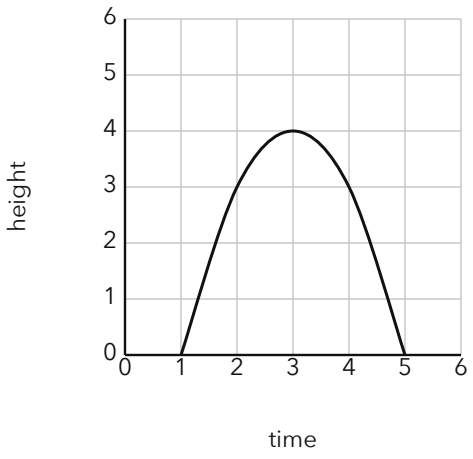
4 For $y = (x + 3)(x - 5)$, state both x-intercepts and the axis of symmetry.

ANSWER _____

_____

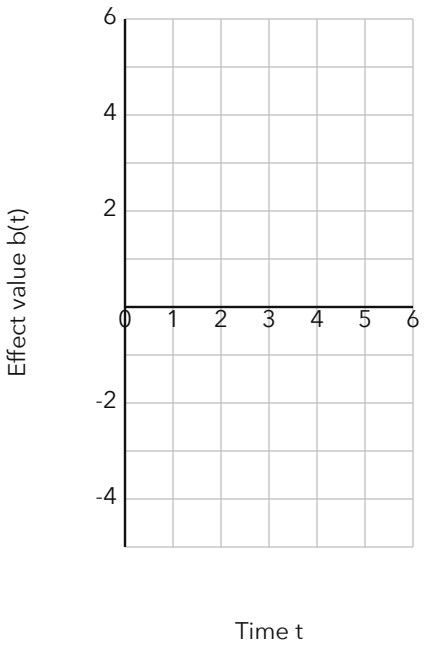
APPLY IT Show your work

1 A game designer graphs a character's jump height over time. Use the graph to find the greatest height and the two times when the character is on the ground.



ANSWER _____

2 A student adds an effect to a video clip. Its value is $b(t) = -(t - 3)^2 + 5$ for $0 \le t \le 6$. On the blank grid, plot b(t) for integer times 0 through 6 and draw the smooth parabola segment. Mark its vertex and the two endpoint values. Then state the greatest effect value and the value at each endpoint.



ANSWER _____

CHALLENGE One step up

A parabola has vertex (1, -3) and passes through (3, 1). Write its equation in vertex form. Then find its exact x-intercepts and explain how you found them.

WORK SPACE AND ANSWER

Feature Finder

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For $y = (x + 2)^2 + 3$, state the vertex and axis of symmetry.	**Vertex: (-2, 3); axis of symmetry: x = -2.**
2	For $y = -(x - 4)^2 + 5$, state the maximum value and range.	**Maximum value: 5; range: y <= 5.**
3	For $f(x) = \|x - 1\| - 6$, state the vertex and y-intercept.	**Vertex: (1, -6); y-intercept: (0, -5).**
4	For $y = (x + 3)(x - 5)$, state both x-intercepts and the axis of symmetry.	**x-intercepts: (-3, 0) and (5, 0); axis of symmetry: x = 1.**

PART 2 · APPLY IT

1. **Greatest height: 4 at time 3. The character is on the ground at times 1 and 5.** Read the vertex for the greatest height. Read the x-intercepts for the times at ground level.
2. **Plot (0, −4), (1, 1), (2, 4), (3, 5), (4, 4), (5, 1), (6, −4). Greatest value: 5 at t = 3. Both endpoint values: −4.** Evaluate b(t) at each integer time. The graph rises to vertex (3, 5), then falls symmetrically. Both included endpoints have value −4.

CHALLENGE

$y = (x - 1)^2 - 3$. Since $1 = a(3 - 1)^2 - 3$, $a = 1$. For x-intercepts, set $y = 0$: $(x - 1)^2 = 3$, so $x = 1 - \sqrt{3}$ and $x = 1 + \sqrt{3}$.

Accept equivalent vertex-form equations and either inequality notation or words for the range. Accept x-intercepts written as points or as x-values when the prompt allows both. For Apply 2, check seven correctly placed points, a smooth downward curve restricted to $0 \le t \le 6$, and a labeled vertex and endpoints. Equal axis scale spacing is required.

Apply 2: parabola segment for 0 ≤ t ≤ 6; vertex (3, 5), endpoints (0, −4) and (6, −4)

