LESSON MAKER PRO

Parabola Path Finder

Read graphs, solve equations, and interpret key features.

HIGH SCHOOL · MA.912.GR.7.5

MA.912.GR.7.5 "Graph and solve mathematical and real-world problems that are modeled with an equation of a parabola. Determine and interpret key features in terms of the context."

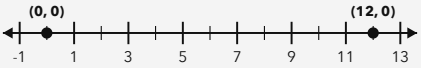
NAME _____ DATE _____

KEY FEATURES

In $y = a(x - h)^2 + k$, 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. To find x-intercepts, set y = 0 and solve.

WORKED EXAMPLE

Use the number line for $y = -(x - 6)^2 + 36$. Find the vertex and x-intercepts.



1. The vertex is (6, 36), so the axis is x = 6.
2. Set $0 = -(x - 6)^2 + 36$.
3. $(x - 6)^2 = 36$, so x = 0 or x = 12.

Answer: Vertex: (6, 36); x-intercepts: (0, 0) and (12, 0)

PRACTICE 4 problems

1 For $y = (x + 2)^2 - 25$, find the vertex and axis of symmetry.

ANSWER _____

2 Solve $-x^2 + 8x + 20 = 0$.

ANSWER _____

3 The number line marks the x-intercepts of $y = -(x + 5)^2 + 9$. Find the vertex and maximum y-value.



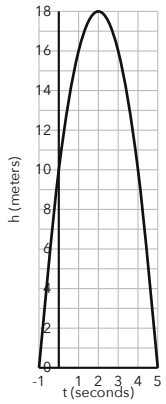
ANSWER _____

4 For $y = 2(x - 3)^2 + 11$, state the minimum value and where it occurs.

ANSWER _____

APPLY IT Show your work

1 A game character's height h, in meters, is shown versus time t, in seconds. What is the greatest height? When does the character land after launch?



ANSWER _____

2 For a concert fundraiser, profit P in dollars is P = -10(x - 5)(x - 9), where x is dozens of tickets sold. At what sales amounts does the fundraiser break even? What is the maximum profit?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A parabola has x-intercepts 2 and 8 and vertex (5, -9). Write its equation in factored form. Explain how the vertex confirms the coefficient.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For $y = (x + 2)^2 - 25$, find the vertex and axis of symmetry.	**Vertex: (-2, -25); axis of symmetry: x = -2**
2	Solve $-x^2 + 8x + 20 = 0$.	**x = -2 or x = 10**
3	The number line marks the x-intercepts of $y = -(x + 5)^2 + 9$. Find the vertex and maximum y-value.	**Vertex: (-5, 9); maximum y-value: 9**
4	For $y = 2(x - 3)^2 + 11$, state the minimum value and where it occurs.	**Minimum value: 11; it occurs at x = 3**

PART 2 · APPLY IT

1. **Greatest height: 18 meters; landing time: 5 seconds** Read the vertex for the greatest height. Use the positive x-intercept for the landing time after launch.
2. **Break-even: 5 dozen and 9 dozen tickets; maximum profit: $40 at 7 dozen tickets** The factors give break-even values of 5 and 9. The vertex is halfway between them at x = 7, and P = 40.

CHALLENGE

y = (x - 2)(x - 8). At x = 5, y = (3)(-3) = -9, so the coefficient is 1.

Accept equivalent equation forms and correctly ordered intercepts. Require context answers to include appropriate units.