LESSON MAKER PRO

Find the Turning Point

Read and describe quadratic graphs

HIGH SCHOOL · A3.G.38

A3.G.38 "Describe the attributes of graphs and the general equations of parent functions (linear, quadratic, cubic, absolute value, rational, exponential, logarithmic, square root, cube root, and greatest integer)."

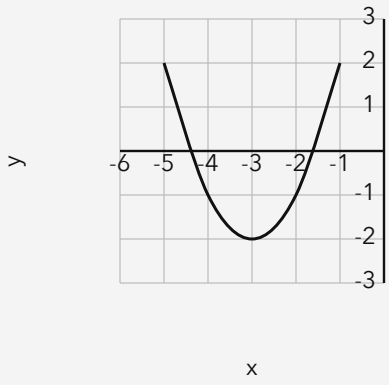
NAME _____ DATE _____

VERTEX AND EXTREME VALUE

In $y=a(x-h)^2+k$, the vertex is (h,k). When a is positive, the graph opens up and k is its minimum value. When a is negative, it opens down and k is its maximum value.

WORKED EXAMPLE

Use the graph to write an equation in vertex form and find its minimum value.



1. Read the vertex: (-3, -2).
2. Moving 1 unit sideways from the vertex raises y by 1, so a=1.
3. Substitute h=-3 and k=-2 into vertex form.

Answer: $y=(x+3)^2-2$; minimum value: -2

PRACTICE 4 problems

1 Find the vertex and minimum value of $y=(x-2)^2+4$.

ANSWER _____

2 Find the vertex and maximum value of $y=-(x+1)^2+6$.

ANSWER _____

3 Find the vertex and minimum value of $y=3(x-5)^2-7$.

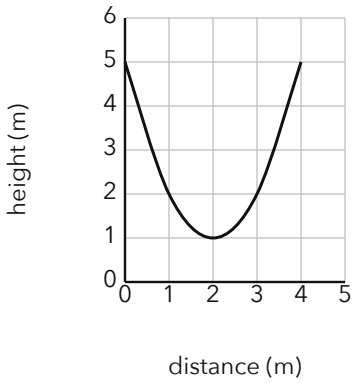
ANSWER _____

4 Find the vertex and maximum value of $y=-5(x+4)^2+3$.

ANSWER _____

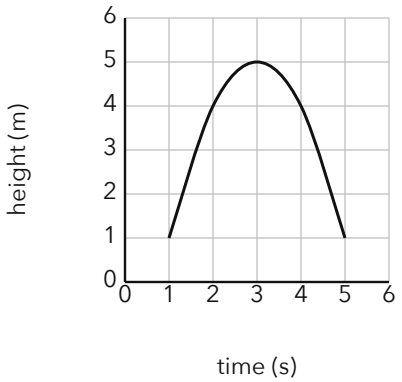
APPLY IT Show your work

1 The graph models a skate ramp's height. Write its equation in vertex form. What is the ramp's lowest height?



ANSWER _____

2 A video game models a ball's height with this graph. When does the ball reach its maximum height, and what is that height?



ANSWER _____

CHALLENGE One step up

A quadratic has vertex (4, -1) and passes through (6, 7). Find its equation in vertex form and its minimum value.

WORK SPACE AND ANSWER

ANSWER KEY

Find the Turning Point

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the vertex and minimum value of $y=(x-2)^2+4$.	**Vertex: (2, 4); minimum value: 4**
2	Find the vertex and maximum value of $y=-(x+1)^2+6$.	**Vertex: (-1, 6); maximum value: 6**
3	Find the vertex and minimum value of $y=3(x-5)^2-7$.	**Vertex: (5, -7); minimum value: -7**
4	Find the vertex and maximum value of $y=-5(x+4)^2+3$.	**Vertex: (-4, 3); maximum value: 3**

PART 2 · APPLY IT

1. **$y=(x-2)^2+1$; lowest height: 1 m** The vertex is (2, 1). Height rises 1 m one meter from the vertex, so a=1.
2. **After 3 s; maximum height: 5 m** The graph opens down, so its vertex (3, 5) gives the time and maximum height.

CHALLENGE

$y=2(x-4)^2-1$; minimum value: -1

For the challenge, substitute (6, 7) into $y=a(x-4)^2-1$ to get a=2. Accept equivalent equations only when they describe the same quadratic.