LESSON MAKER PRO

Find the Turning Point

Read a quadratic's vertex from its form.

HIGH SCHOOL · MT.CORE.ALG.QUAD.3.d

MT.CORE.ALG.QUAD.3.d "Understand that quadratic expressions can be represented in multiple forms and the specific features of each form by: Understanding the relationship between vertex form and the vertex of the function."

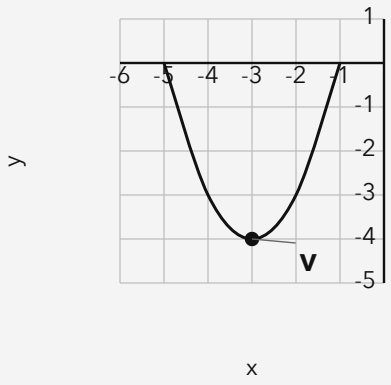
NAME _____ DATE _____

VERTEX FORM

In $f(x) = a(x - h)^2 + k$, the vertex is (h, k). If a is positive, the vertex gives the minimum value. If a is negative, it gives the maximum value.

WORKED EXAMPLE

Use $f(x) = (x + 3)^2 - 4$ and the graph to find the vertex and minimum value.



1. Rewrite $x + 3$ as $x - (-3)$, so $h = -3$.
2. The number outside the square is $k = -4$.
3. The graph opens up, so the vertex gives the minimum.

Answer: Vertex: (-3, -4); minimum value: -4.

PRACTICE 4 problems

1 Find the vertex of $f(x) = 2(x - 1)^2 + 6$.

ANSWER _____

2 Find the vertex of $f(x) = -(x + 2)^2 + 5$.

ANSWER _____

3 Write a rule in vertex form with vertex (0, -2) and a = -1.

ANSWER _____

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

ANSWER _____

APPLY IT Show your work

1 A concert stage has an arch shaped by $h(x) = -(x - 2)^2 + 5$. Here, x is distance from one side in meters, and h is height in meters. Where is the arch highest, and how high is it?

WORK SPACE

ANSWER _____

2 A skate bowl's surface follows $h(x) = (1/8)(x - 4)^2$. Here, x is distance from one edge in meters, and h is height above the bowl's floor in meters. Where is the lowest point, and how high is it?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A parabola has vertex (-1, 2) and passes through (1, 10). Write its rule in vertex form. Show how you find a.

WORK SPACE AND ANSWER

ANSWER KEY

Find the Turning Point

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the vertex of $f(x) = 2(x - 1)^2 + 6$.	**(1, 6)**
2	Find the vertex of $f(x) = -(x + 2)^2 + 5$.	**(-2, 5)**
3	Write a rule in vertex form with vertex (0, -2) and a = -1.	**$f(x) = -(x - 0)^2 - 2$**
4	Find the vertex and maximum value of $f(x) = -2(x - 6)^2 + 1$.	**Vertex: (6, 1); maximum value: 1.**

PART 2 · APPLY IT

1. **2 meters from the side; 5 meters high.** The vertex is (2, 5). The negative coefficient makes it the highest point.
2. **4 meters from the edge; 0 meters above the floor.** The vertex is (4, 0). The positive coefficient makes it the lowest point.

CHALLENGE

Start with $f(x) = a(x + 1)^2 + 2$. Substitute (1, 10): $10 = a(1 + 1)^2 + 2$, so $8 = 4a$ and $a = 2$. Thus $f(x) = 2(x + 1)^2 + 2$.

For the rule with vertex (0, -2), also accept $f(x) = -x^2 - 2$ if students explain that x - 0 = x. In the challenge, accept any correct substitution that gives a = 2.