LESSON MAKER PRO

Parabola Plot Points

Use key features to sketch parabolas.

HIGH SCHOOL · PC.CS.1.3

PC.CS.1.3 "Sketch a graph of a conic section using its key features."

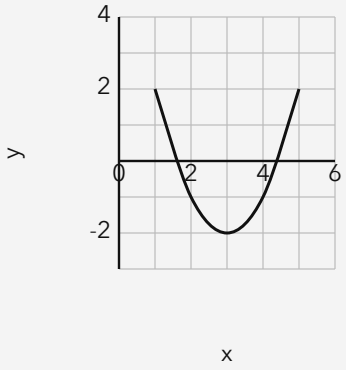
NAME _____ DATE _____

SKETCH FROM THE VERTEX

For $y = a(x - h)^2 + k$, plot the vertex (h, k) first. Choose x-values the same distance to either side of h to find matching points, then draw a smooth curve through them. The curve opens up if a is positive and down if a is negative.

WORKED EXAMPLE

Use the graph to find the vertex and write the parabola's equation.



1. The lowest point is the vertex, (3, -2).
2. Start with $y = a(x - 3)^2 - 2$.
3. At (4, -1), $-1 = a(1)^2 - 2$, so $a = 1$.

Answer: Vertex: (3, -2); equation: $y = (x - 3)^2 - 2$.

PRACTICE 4 problems

1 Sketch $y = (x + 2)^2 + 1$. Label the vertex and two points equally far from it.

ANSWER _____

2 Sketch $y = -(x - 1)^2 + 3$. Label the vertex and two points equally far from it.

ANSWER _____

3 Sketch $y = 2(x + 1)^2 - 2$. Label the vertex and both x-intercepts.

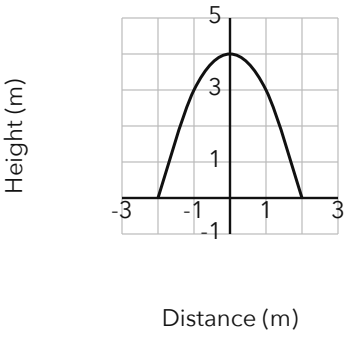
ANSWER _____

4 Sketch $y = -(1/2)(x - 2)^2 + 1$. Label the vertex and the points where $x = 0$ and $x = 4$.

ANSWER _____

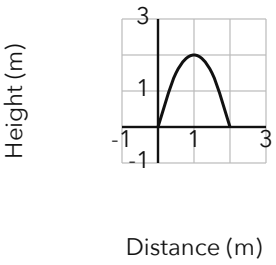
APPLY IT Show your work

1 A BMX rider's jump follows the plotted arc. Sketch the arc and label its highest point and both ground crossings. How far apart are the ground crossings?



ANSWER _____

2 A basketball's path follows the plotted arc. Use its peak and a ground crossing to write an equation for the path. Sketch the arc and label those features.



ANSWER _____

CHALLENGE One step up

Sketch $y = x^2 - 4x + 1$. Complete the square to explain how you found the vertex, then label two points equally far from it.

WORK SPACE AND ANSWER

ANSWER KEY

Parabola Plot Points

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch $y = (x + 2)^2 + 1$. Label the vertex and two points equally far from it.	**Vertex: (-2, 1). Points: (-3, 2) and (-1, 2); curve opens up.**
2	Sketch $y = -(x - 1)^2 + 3$. Label the vertex and two points equally far from it.	**Vertex: (1, 3). Points: (0, 2) and (2, 2); curve opens down.**
3	Sketch $y = 2(x + 1)^2 - 2$. Label the vertex and both x-intercepts.	**Vertex: (-1, -2). x-intercepts: (-2, 0) and (0, 0); curve opens up.**
4	Sketch $y = -(1/2)(x - 2)^2 + 1$. Label the vertex and the points where $x = 0$ and $x = 4$.	**Vertex: (2, 1). Points: (0, -1) and (4, -1); curve opens down.**

PART 2 · APPLY IT

1. **Highest point: (0, 4). Ground crossings: (-2, 0) and (2, 0), which are 4 m apart.** Read the vertex and x-intercepts from the graph. Subtract the crossing positions: 2 - (-2) = 4.
2. **$y = -2(x - 1)^2 + 2$. Peak: (1, 2); ground crossings: (0, 0) and (2, 0).** The peak gives $y = a(x - 1)^2 + 2$. Substitute (0, 0) to get $a = -2$.

CHALLENGE

$y = (x - 2)^2 - 3$, so the vertex is (2, -3). Points (1, -2) and (3, -2) lie on the upward-opening curve.

Accept any correct pair of symmetric points in the first two practice sketches. Sketches should be smooth parabolas with the stated features in the correct positions.