

Parabola Power

Sketch quadratic graphs from their equations.

HIGH SCHOOL • HSF-IF.C.7

CCSS.Math.Content.HSF-IF.C.7 "Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. *"

NAME _____

DATE _____

READ THE VERTEX FORM

In $y=a(x-h)^2+k$, the vertex is (h, k) and the axis of symmetry is $x=h$. A positive a opens the parabola up, and a negative a opens it down.

WORKED EXAMPLE

Graph $y=7(x-8)^2-9$.

1. The vertex is $(8, -9)$.
2. The axis of symmetry is $x=8$.
3. Because 7 is positive, the parabola opens up.
4. One unit from $x=8$ gives $y=7(1)^2-9=-2$, so plot $(7, -2)$ and $(9, -2)$.

Answer: Vertex: $(8, -9)$; axis: $x=8$; opens up.

PRACTICE 5 problems

- 1** Sketch $y=(x+1)^2+4$. State the vertex, axis, and opening.

ANSWER _____

- 2** Sketch $y=-(x-4)^2+1$. State the vertex, axis, and opening.

ANSWER _____

- 3** Sketch $y=x^2-6$. State the vertex, axis, and opening.

ANSWER _____

- 4** Sketch $y=(x-6)(x+4)$. State the vertex, axis, and opening.

ANSWER _____

- 5** Sketch $y=-(x+6)^2-1$. State the vertex, axis, and opening.

ANSWER _____

APPLY IT Show your work

- 1** A drone club launches a camera drone. Its height in meters after t seconds is $h(t) = -(t-4)^2 + 16$. Sketch the graph from launch until it lands. What is the greatest height, and when does it occur?

WORK SPACE

ANSWER _____

- 2** A student club models its profit P , in dollars, from selling x dozen stickers by $P(x) = -(x-6)^2 + 36$. Sketch the graph. What is the maximum profit, and when does the club break even?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Rewrite $y = -x^2 + 6x - 5$ in vertex form. Then state its vertex, axis of symmetry, x -intercepts, and y -intercept.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch $y=(x+1)^2+4$. State the vertex, axis, and opening.	Vertex: (-1, 4); axis: $x=-1$; opens up.
2	Sketch $y=-(x-4)^2+1$. State the vertex, axis, and opening.	Vertex: (4, 1); axis: $x=4$; opens down.
3	Sketch $y=x^2-6$. State the vertex, axis, and opening.	Vertex: (0, -6); axis: $x=0$; opens up.
4	Sketch $y=(x-6)(x+4)$. State the vertex, axis, and opening.	Vertex: (1, -25); axis: $x=1$; opens up.
5	Sketch $y=-(x+6)^2-1$. State the vertex, axis, and opening.	Vertex: (-6, -1); axis: $x=-6$; opens down.

PART 2 · APPLY IT

- The greatest height is 16 meters at 4 seconds. The drone lands at 8 seconds.** The vertex is (4, 16), so it gives the maximum. Set $h(t)=0$ to find the landing times.
- Maximum profit: \$36 when 6 dozen stickers are sold. Break-even points: 0 dozen and 12 dozen stickers.** The vertex (6, 36) gives the maximum profit. Set $P(x)=0$ to find the break-even values.

CHALLENGE

$y=-(x-3)^2+4$; vertex: (3, 4); axis: $x=3$; x-intercepts: (1, 0) and (5, 0); y-intercept: (0, -5).

Accept equivalent vertex-form equations and correctly labeled sketches with the stated symmetry and opening. For the challenge, accept x-intercepts written as $x=1$ and $x=5$.