

Curve Zone

Graph regions bounded by quadratic curves.

HIGH SCHOOL • MA.912.AR.3.10

MA.912.AR.3.10 "Given a mathematical or real-world context, graph the solution set to a two-variable quadratic inequality."

NAME _____

DATE _____

GRAPH THE BOUNDARY

First graph the equation made by replacing the inequality sign with $=$. Use a solid boundary for $\leq$ or $\geq$ and a dashed boundary for $<$ or $>$. Test a point not on the boundary, then shade the side where the inequality is true.

WORKED EXAMPLE

Graph $y > x^2 - 9$.

1. Graph the boundary $y = x^2 - 9$.
2. Make the parabola dashed because $>$ does not include the boundary.
3. Test $(0,0)$: $0 > -9$ is true.
4. Shade the region above the dashed parabola.

Answer: Dashed parabola $y = x^2 - 9$, with the region above it shaded.

PRACTICE 6 problems

1 Graph $y \leq x^2 + 4$.

ANSWER _____

2 Graph $y > -x^2 + 5$.

ANSWER _____

3 Graph $y \geq (x - 4)^2 - 6$.

ANSWER _____

4 Graph $y < -(x + 5)^2 + 7$.

ANSWER _____

5 Graph $x^2 + y^2 \leq 16$.

ANSWER _____

6 Graph $y \geq x^2 - 8x + 12$.

ANSWER _____

APPLY IT Show your work

- 1** For a school concert, approved spotlight positions on a coordinate map satisfy $y \leq -x^2 + 8x - 12$. Graph all approved positions.

WORK SPACE

ANSWER _____

- 2** A drone camera for the school sports channel must stay in the region $x^2 + y^2 \leq 25$ on a coordinate map measured in meters. Graph the allowed region.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Graph $(y - 1)^2 \leq 4(x + 2)$. Then write one sentence explaining why you shaded that side of the parabola.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph $y \leq x^2 + 4$.	Solid parabola $y = x^2 + 4$, with the region on and below the parabola shaded.
2	Graph $y > -x^2 + 5$.	Dashed parabola $y = -x^2 + 5$, with the region above the parabola shaded.
3	Graph $y \geq (x - 4)^2 - 6$.	Solid parabola with vertex $(4, -6)$, opening up. Shade the region on and above the parabola.
4	Graph $y < -(x + 5)^2 + 7$.	Dashed parabola with vertex $(-5, 7)$, opening down. Shade the region below the parabola.
5	Graph $x^2 + y^2 \leq 16$.	Solid circle centered at $(0, 0)$ with radius 4. Shade the inside of the circle, including the boundary.
6	Graph $y \geq x^2 - 8x + 12$.	Solid parabola $y = (x - 4)^2 - 4$, with vertex $(4, -4)$. Shade the region on and above the parabola.

PART 2 · APPLY IT

- Solid parabola $y = -(x - 4)^2 + 4$, with vertex $(4, 4)$. Shade the region on and below the parabola.** Complete the square: $-x^2 + 8x - 12 = -(x - 4)^2 + 4$. The $\leq$ sign means the boundary is solid and the region below it is included.
- Solid circle centered at $(0, 0)$ with radius 5. Shade the inside of the circle, including the boundary.** The equation $x^2 + y^2 = 25$ is a circle with radius 5. The $\leq$ sign includes every point inside the circle and on it.

CHALLENGE

Solid parabola $(y - 1)^2 = 4(x + 2)$, with vertex $(-2, 1)$, opening right. Shade the region on and to the right of the parabola because $x \geq (y - 1)^2/4 - 2$.

Accept equivalent equations, such as completed-square forms, and equivalent descriptions of the shaded region. A correct graph must show the correct solid or dashed boundary and the correct side shaded.