

Shade the Parabola

Graph two-variable quadratic inequality regions.

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 _____

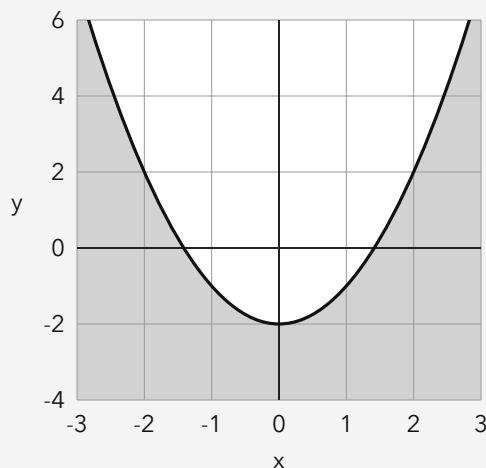
You will need: Pencil; Ruler

BOUNDARY AND REGION

Graph the boundary parabola. Use a solid boundary for $\leq$ or $\geq$ and a dashed boundary for $<$ or $>$. Test a point to choose the shaded side: y greater means above, y less means below. Shading continues beyond the displayed window wherever the inequality holds.

WORKED EXAMPLE

Graph $y \leq x^2 - 2$.

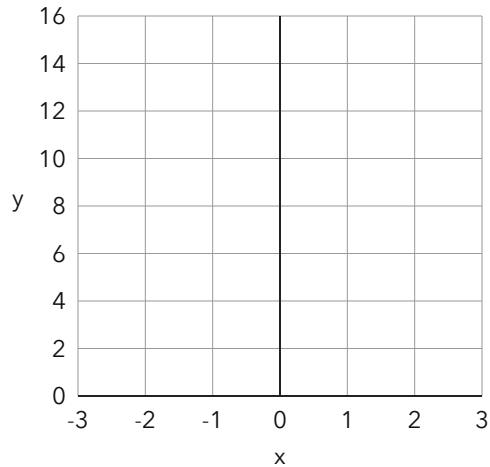


1. The $\leq$ symbol includes the boundary, so the parabola is solid.
2. Test $(0, -3)$: $-3 \leq -2$ is true.
3. Shade the region below the parabola, including the curve.

Answer: Solid boundary $y = x^2 - 2$; shade on and below the parabola.

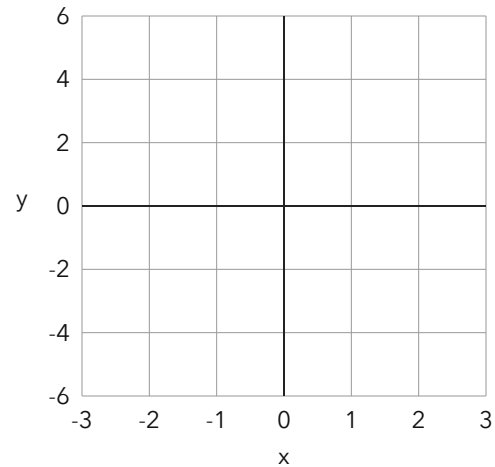
PRACTICE 4 problems

- 1** Graph $y > x^2 + 5$. State the boundary type and shading.



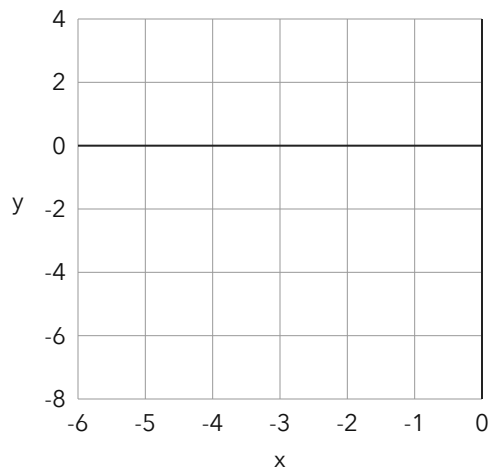
ANSWER _____

- 2** Graph $y \leq -x^2 + 4$. State the boundary type and shading.



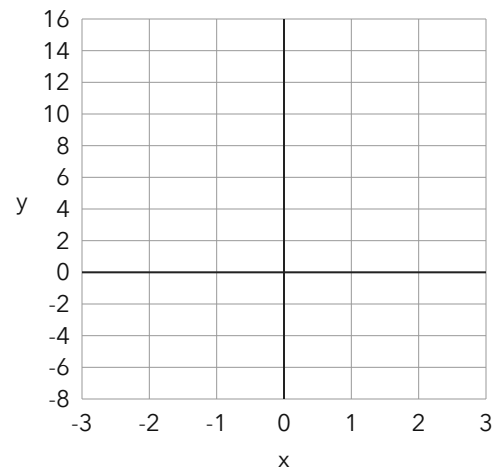
ANSWER _____

- 3** Graph $y < -(x + 3)^2 + 1$. State the boundary type and shading.



ANSWER _____

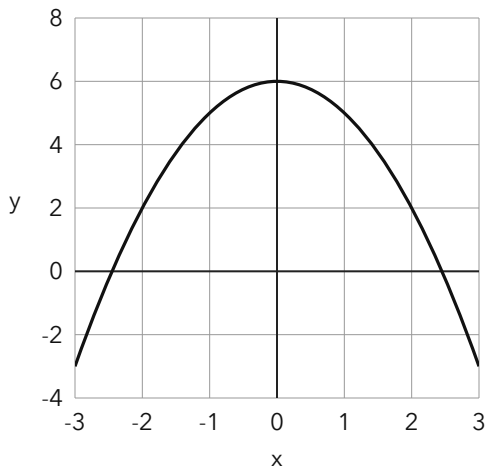
- 4** Graph $y \geq 3x^2 - 7$. State the boundary type and shading.



ANSWER _____

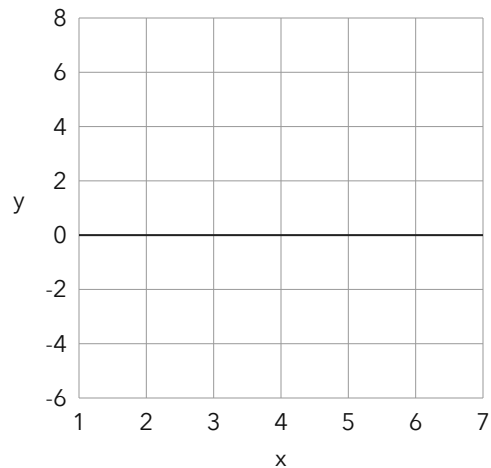
APPLY IT Show your work**1**

In a game, bonus icons appear on or above the solid arc shown. Shade the bonus region.

**REASONING AND ANSWER**

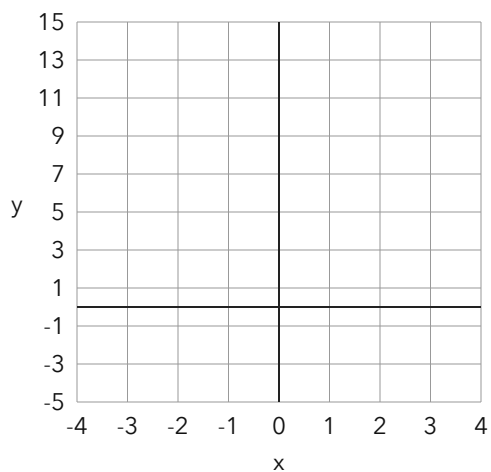
2

At a concert, a phone-camera zone is modeled by $y > (x - 4)^2 - 5$, where x and y are floor coordinates. Graph the zone.

**REASONING AND ANSWER**

CHALLENGE One step up

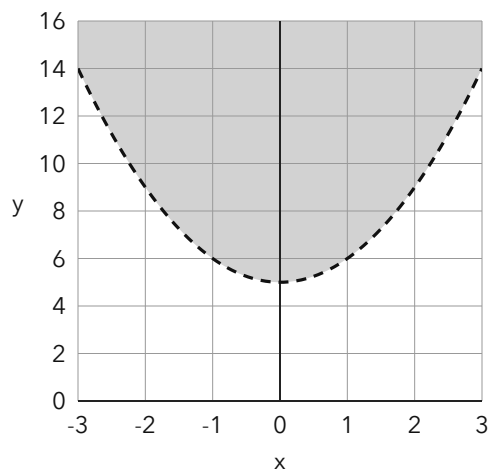
Graph all points satisfying $y > (x - 1)^2 - 4$ for $-3 \leq x \leq 3$. Show whether each boundary is included.



WORK SPACE AND ANSWER

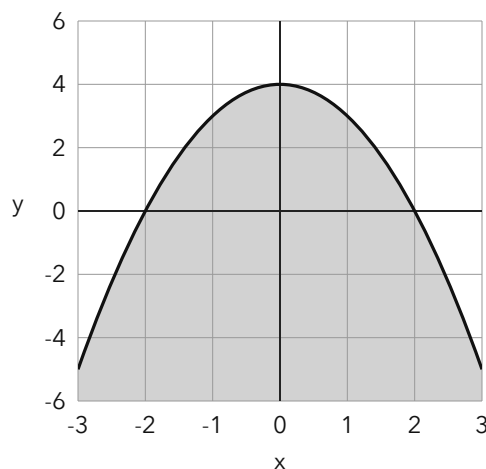
PRACTICE 1

Dashed boundary $y = x^2 + 5$; shade above the parabola.



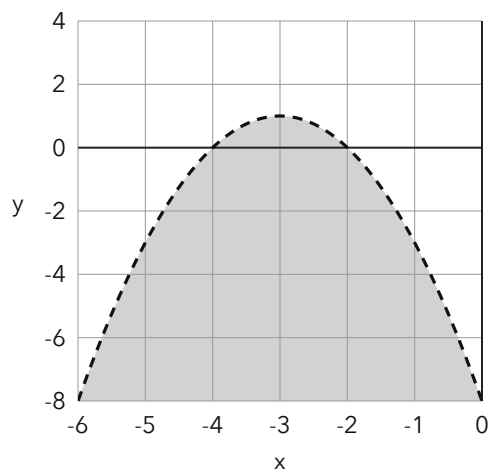
PRACTICE 2

Solid boundary $y = -x^2 + 4$; shade on and below the parabola.



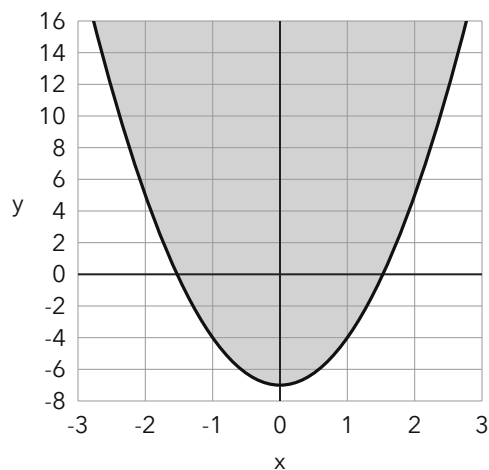
PRACTICE 3

Dashed boundary $y = -(x + 3)^2 + 1$; shade below the parabola.



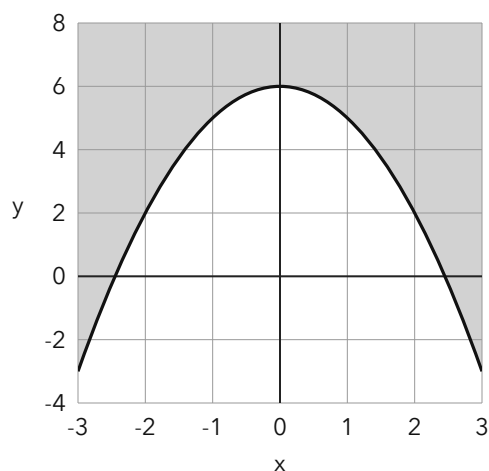
PRACTICE 4

Solid boundary $y = 3x^2 - 7$; shade on and above the parabola.



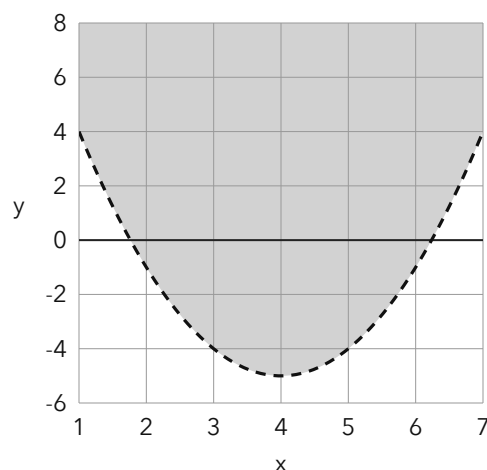
APPLY IT 1

Shade the region on and above $y = -x^2 + 6$, including the arc. The arc is solid, so points on it are included. "On or above" means shade the region above the downward-opening parabola.



APPLY IT 2

Draw $y = (x - 4)^2 - 5$ as a dashed parabola and shade above it. The $>$ symbol makes the boundary dashed. Points with y-values greater than the quadratic expression lie above the parabola.



CHALLENGE

Draw $y = (x - 1)^2 - 4$ as a dashed parabola. Shade above it only for $-3 \leq x \leq 3$, including the vertical edges at $x = -3$ and $x = 3$ where they are in the shaded region.

Require a plotted boundary and correctly shaded region, not just a written description. Curves are dashed for strict inequalities and solid when equality is included. Graph-window edges are not extra constraints. In the challenge the vertical edges are included only above the excluded parabola; their intersection points with it remain excluded.

