LESSON MAKER PRO

Parabola Boundary Zones

Turn curved boundaries into inequalities.

HIGH SCHOOL · MA.912.AR.3.9

MA.912.AR.3.9 "Given a mathematical or real-world context, write two-variable quadratic inequalities to represent relationships between quantities from a graph or a written description."

NAME _____ DATE _____

READ THE SHADING

Start with the equation of the parabola that forms the boundary, often y = a(x-h)^2 + k. If the shaded region is above the parabola, use > or >=. If it is below, use < or <=. Use >= or <= for a solid boundary because the curve is included, and use > or < for a dashed boundary because the curve is not included.

WORKED EXAMPLE

A dashed parabola has equation y = 11(x-13)^2 + 17. The region above the parabola is shaded. Write the inequality.

1. The boundary equation is y = 11(x-13)^2 + 17.
2. Shading above the boundary means y is greater than the boundary expression.
3. The dashed curve is not included, so use >.

Answer: y > 11(x-13)^2 + 17

PRACTICE 6 problems

1 A solid parabola has equation y = x^2. The region on and below the parabola is shaded. Write the inequality.

ANSWER _____

2 A dashed parabola has equation y = -x^2 + 4. The region above the parabola is shaded. Write the inequality.

ANSWER _____

3 The boundary is the solid parabola y = (x+2)^2 + 1. The region above the parabola is shaded. Write the inequality.

ANSWER _____

4 The boundary is the dashed parabola y = 3(x-1)^2 - 6. The region below the parabola is shaded. Write the inequality.

ANSWER _____

5 A graph shows the solid boundary y = -2x^2 + 5. The shaded region is on and below the curve. Write the inequality.

ANSWER _____

6 A dashed parabola has equation y = 1/4(x+4)^2 - 3. The region above the parabola is shaded. Write the inequality.

ANSWER _____

APPLY IT Show your work

1 A student council designs a curved top for a concert-photo backdrop. On a coordinate grid, the top edge is y = -x^2 + 8x + 2. The printed backdrop includes the edge and every point below it. Write an inequality for points (x,y) on the backdrop.

WORK SPACE

ANSWER _____

2 At a skate park, the cross-section of a bowl's floor is y = 1/2(x-6)^2 - 7. The riding space is on or above the floor, including the floor. Write an inequality for points (x,y) in the riding space.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A graph has a solid upward-opening parabola as its boundary. The parabola has vertex (3,-4) and passes through (1,4). The shaded region is on and below the parabola. Write the inequality.

_____

_____

ANSWER KEY

Parabola Boundary Zones

HIGH SCHOOL · MA.912.AR.3.9

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A solid parabola has equation y = x^2. The region on and below the parabola is shaded. Write the inequality.	**y <= x^2**
2	A dashed parabola has equation y = -x^2 + 4. The region above the parabola is shaded. Write the inequality.	**y > -x^2 + 4**
3	The boundary is the solid parabola y = (x+2)^2 + 1. The region above the parabola is shaded. Write the inequality.	**y >= (x+2)^2 + 1**
4	The boundary is the dashed parabola y = 3(x-1)^2 - 6. The region below the parabola is shaded. Write the inequality.	**y < 3(x-1)^2 - 6**
5	A graph shows the solid boundary y = -2x^2 + 5. The shaded region is on and below the curve. Write the inequality.	**y <= -2x^2 + 5**
6	A dashed parabola has equation y = 1/4(x+4)^2 - 3. The region above the parabola is shaded. Write the inequality.	**y > 1/4(x+4)^2 - 3**

PART 2 · APPLY IT

1. **y <= -x^2 + 8x + 2** The backdrop includes its curved edge, so the inequality includes equality. Points on the backdrop are below the top edge, so use <=.
2. **y >= 1/2(x-6)^2 - 7** The riding space is above the floor curve. Because the floor is included, use >=.

CHALLENGE

y <= 2(x-3)^2 - 4

Accept equivalent quadratic forms, including expanded forms, as long as the boundary equation and inequality symbol are correct. For the challenge, y <= 2x^2 - 12x + 14 is equivalent.