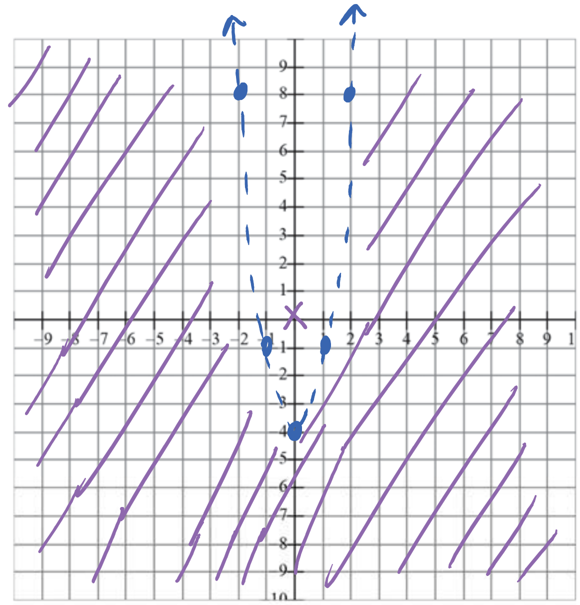
5.3 Graphing Quadratic Inequalities in Two Variables

In a quadratic inequality the solution area is either ___above___ or ___below___ the parabola.

We will use a similar method to graph quadratic inequalities as we did with linear inequalities.

Example #1: Graph the inequality: $y < 3x^2 - 4$ → dotted line



① Graph $y = 3x^2 - 4$

Vertex $(0, -4)$

Steps: 1, 3, 5

×3: 3, 9, 15

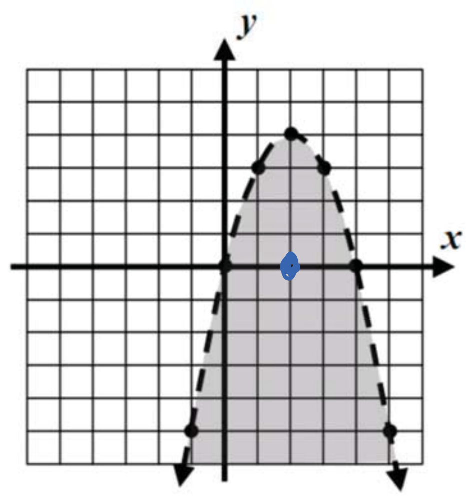
② Test Point (0,0):

$0 < 3(0)^2 - 4$

$0 < -4$

FALSE

Example #2: Write an inequality to describe the inequality.



we know:

- vertex (2, 4)
- opens down
- steps: 1, 3, 5 → coefficient of 1 for x^2
- inequality > or <

$y = -(x-2)^2 + 4$

Guess + check the direction

$y < -(x-2)^2 + 4$

Test (2,0):

$0 < -(2-2)^2 + 4$

$0 < 4$

TRUE

$y < -(x-2)^2 + 4$

Example #3: Two numbers are related in this way: the sum of 2 and 3 times the square of one number is greater than or equal to 5 minus three times the other number.

a. Graph the inequality that represents this relationship.

Let x and y be the #'s

$2 + 3x^2 \geq 5 - 3y$

$-2 \quad -3x^2 \quad +3y$

$\frac{3y}{3} \geq \frac{-3x^2}{3} + \frac{3}{3}$

solid line

$y \geq -x^2 + 1$

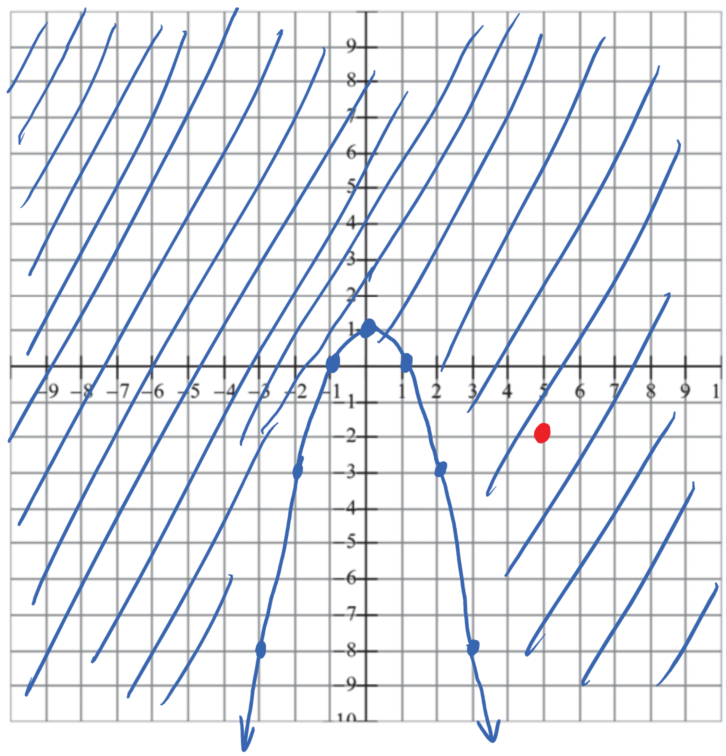
Vertex: (0,1)

Test (0, 0):

$0 \geq -0^2 + 1$

$0 \geq 1$

False



b. Use the graph to list a pair of integer values for the two numbers.

Infinitely many solutions!

(5, -2)