Pre-Calculus 11
Chapter 9: Linear and Quadratic Inequalities

9.3 Quadratic Inequalities in Two Variables

Recently, we've looked at solving quadratic inequalities (in 1 variable) graphically and algebraically. We now conclude with examining quadratic inequalities in 2 variables.

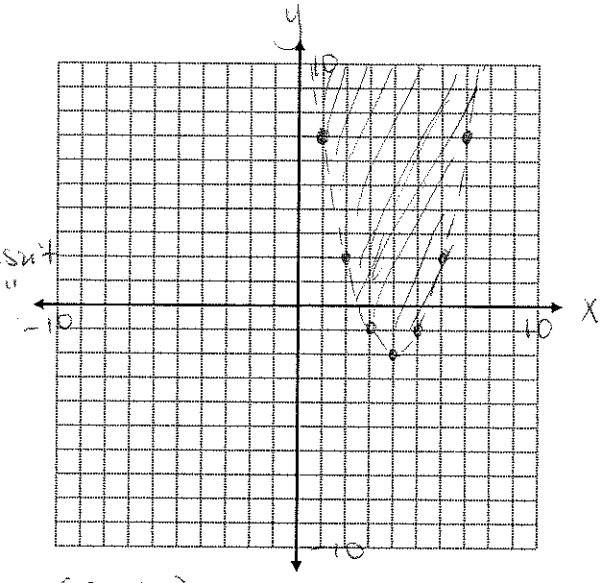
These inequalities graphically represent a solution region and a parabolic boundary curve.

Example: Graph each inequality. Clearly label scale and axes.

a) $y > (x-4)^2 - 2$

Boundary line: • Parabola that opens "up" with vertex (4, -2)

• Dashed line because the inequality doesn't include "equal to"



• Choose a test point: (0, 0)

$0 > (0-4)^2 - 2$

$0 > 16 - 2$

$0 > 14$ ×

Shade the region without (0, 0)

b) $y \leq 2(x+3)^2 - 4$

Vertex: (-3, -4)

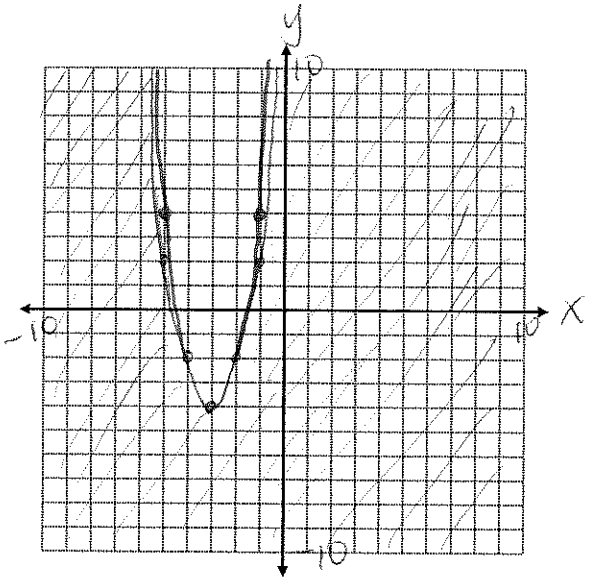
Test (0, 0)

$0 \leq 2(0+3)^2 - 4$

$0 \leq 2(9) - 4$

$0 \leq 14$ ✓

Shade the region that includes (0, 0)



c) $y \geq -\frac{1}{2}(x+4)^2+1$

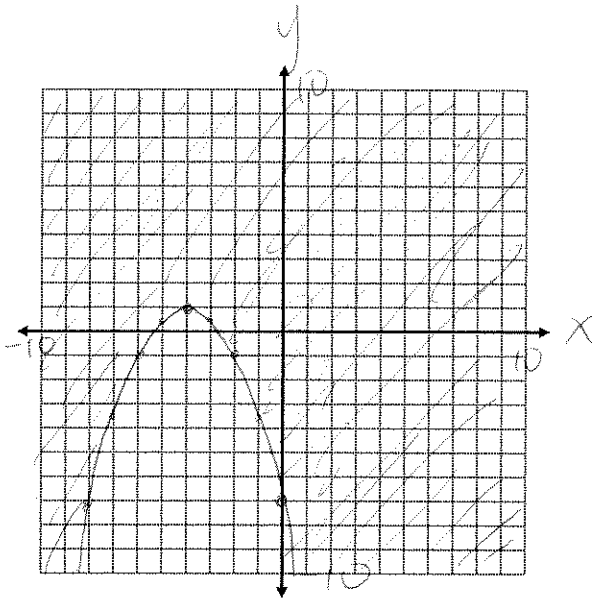
- Parabola opens "down" with vertex $(-4,1)$

- Test $(0,0)$

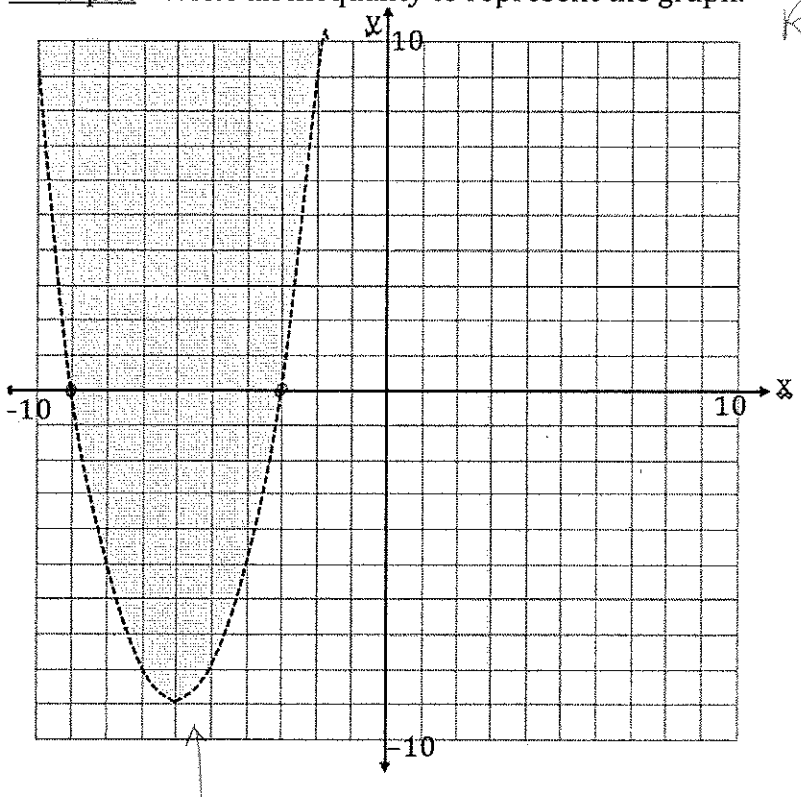
$0 \geq -\frac{1}{2}(0+4)^2+1$

$0 \geq -\frac{1}{2}(16)+1$

$0 \geq -7$ ✓



Example: Write an inequality to represent the graph.



dashed line.

Roots: $-9, -3$

$y \square (x+9)(x+3)$

$y \square x^2+12x+27$

Test point: $(0,0)$

$0 \boxed{<} 27$

Since $(0,0)$ is NOT in the shaded region, use $>$.

$y > x^2+12x+27$