4.9 – Graphing Quadratic Inequalities

A quadratic inequality in two variables can be written in one of the following forms:

$y < ax^2 + bx + c$ $\quad$ $y \leq ax^2 + bx + c$ $\quad$ $y > ax^2 + bx + c$ $\quad$ $y \geq ax^2 + bx + c$

The graph of any such inequality consists of (x, y) all solutions of the inequality

Graphing a Quadratic Inequality

Step 1 **Graph** the parabola with equation $y = ax^2 + bx + c$. Make the parabola *dashed* for inequalities with $<$ or $>$ and *solid* for inequalities with $\leq$ or $\geq$.

Step 2 **Test** a point (x, y) inside the parabola to determine whether the point is a solution of the inequality.

Step 3 **Shade** the region inside the parabola if the point from Step 2 is a solution. Shade the region outside the parabola if it is not a solution.

S1 Example 1 Graph $y < x^2 + 3x - 4$

① $y = x^2 + 3x - 4$

$0 = (x+4)(x-1)$

$x + 4 = 0 \quad x - 1 = 0$

$x = -4 \quad x = 1$

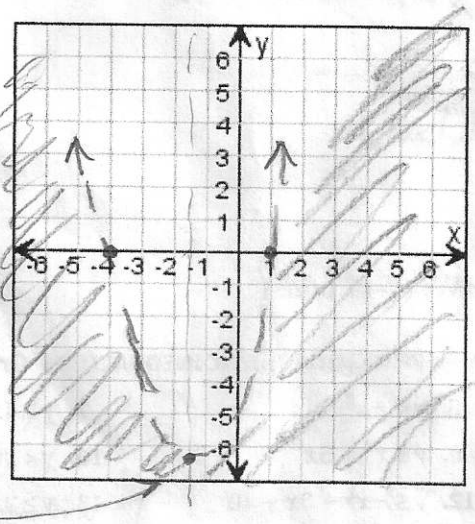
② $x = \frac{-b}{2a} = \frac{-3}{2}$

③ $y = (-\frac{3}{2})^2 + 3(-\frac{3}{2}) - 4$

$y = \frac{9}{4} - \frac{9}{2} - 4$

$y = -6.25$

$(-\frac{3}{2}, -6.25)$



S2 $(0,0)$

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

$0 < -4$

False

Example 2 Graph $y \leq x^2 - 4$

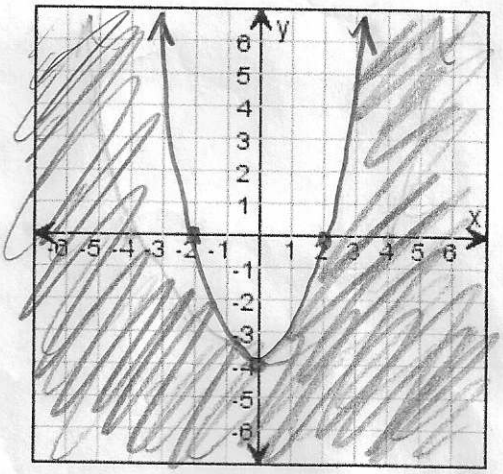
S1 ① $y = x^2 - 4$

$0 = (x+2)(x-2)$

$x = \pm 2$

② y-int $(x=0)$

$y = -4$



S2 $(0,0)$

$0 \leq 0^2 - 4$

$0 \leq -4$

False

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Example 3 Graph $y > -x^2 - 2x + 3$

① $y = -x^2 - 2x + 3$

$0 = -(x^2 + 2x - 3)$

$0 = -1(x+3)(x-1)$

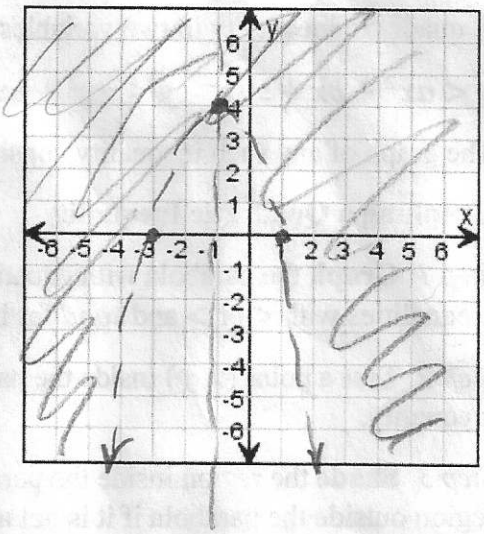
$x = -3 \quad x = 1$

② aos $\frac{-b}{2a} = \frac{2}{-2} = -1$

③ $y = -(-1)^2 - 2(-1) + 3$

$y = -1 + 2 + 3$

$y = 4$



52 $(0,0)$

$0 > -0^2 - 2(0) + 3$

$0 > 3$

False

HW: (7-17 odds)

GRAPHING QUADRATIC INEQUALITIES **Graph the inequality.**

6. $y < -x^2$
7. $y \geq 4x^2$
8. $y > x^2 - 9$
9. $y \leq x^2 + 5x$
10. $y < x^2 + 4x - 5$
11. $y > x^2 + 7x + 12$
12. $y \leq -x^2 + 3x + 10$
13. $y \geq 2x^2 + 5x - 7$
14. $y \geq -2x^2 + 9x - 4$
15. $y < 4x^2 - 3x - 5$
16. $y > 0.1x^2 - x + 1.2$
17. $y \leq -\frac{2}{3}x^2 + 3x + 1$