NOTES Sec. 2-7 Solving Quadratic Inequalities

Sept 24

Graphing quadratic inequalities is similar to graphing linear inequalities.

Graph $y \le -x^2 + 2x + 3$.

Step 1 Draw the graph of $y = -x^2 + 2x + 3$.

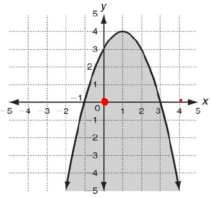
- $a = -1$, so the parabola opens downward.
- vertex at (1, 4)

$-\frac{b}{2a} = -\frac{2}{2(-1)} = 1$, and $f(1) = 4$

- y-intercept is 3, so the curve also passes through (2, 3)

Draw a solid boundary line for $\le$ or $\ge$.

(Draw a dashed boundary line for $<$ or $>$.)



Step 2 To decide where to shade, choose a test point which is either inside or outside of the parabola. Let's use (0, 0).

(4,0) $0 \le -16+8+3$

$0 \le -5$ F

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

?: $0 \le -(0)^2 + 2(0) + 3$

✓ : $0 \le 3$

Since the statement is true, shade the area where the test point is located.

Graph the inequality.

1. $y < 2x^2 - 8x + 6$

Vertex: (2,-2)

$y = 2x^2 - 8x + 6$

$x = \frac{-b}{2a} = \frac{8}{4}$

y-intercept: (0,6)

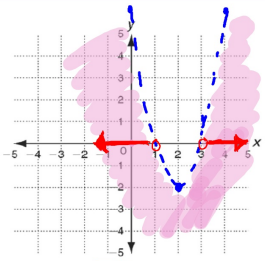
CK (0,0) $0 < 0 - 0 + 6$ T

Solve $0 = \frac{2x^2 - 8x + 6}{2}$

$0 = x^2 - 4x + 3$

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

$x = 3, 1$



$0 < (x-3)(x-1)$

$x < 1$ OR $x > 3$

You can use algebra to solve quadratic inequalities.

Solve the inequality $x^2 - 2x - 5 \le 3$.

Step 1 Write the related equation. $x^2 - 2x - 5 = 3$

Step 2 Solve the equation.

$x^2 - 2x - 8 = 0$

$(x - 4)(x + 2) = 0$

Write the equation in standard form. Then factor to solve for x.

$(x - 4) = 0$ or $(x + 2) = 0$

$x = 4$ or $x = -2$

These solutions are called **critical values.**

Step 3 Since the inequality is $\le$, locate the solutions on the number line using closed circles.

Step 4 Using the original inequality, test a value for x in each interval on the number line.

$x^2 - 2x - 5 \le 3$

$x \le -2$:	Try -3. $(-3)^2 - 2(-3) - 5 \le 3$?	$10 \le 3$ False.
$-2 \le x \le 4$:	Try 0. $(0)^2 - 2(0) - 5 \le 3$?	$-5 \le 3$ True.
$x \ge 4$:	Try 5. $(5)^2 - 2(5) - 5 \le 3$?	$10 \le 3$ False.

Step 5 Shade the solution on a number line. Write the algebraic solution from the graph.

$-2 \le x \le 4$

Solve each inequality. Graph the solution on a number line.

2. $2x^2 - x > 3$

$2x^2 - 1x - 3 = 0$

$(2x - 3)(x + 1) = 0$

$x = 3/2$ or -1

T F T

−1 0 1 3/2 2

CK: −2 $8 + 2 > 3$ T

0 $0 > 3$ F

2 $8 - 2 > 3$ T

$x < -1$ OR $x > \frac{3}{2}$

3. $3x^3 + 11x^2 - 4x \le 0$

$x(3x^2 + 11x - 4) = 0$ $12x, -1x$

$x(3x - 1)(x + 4) = 0$ $12x$

$x = 0, 1/3, -4$

T F T F

−4 0 1/3 1

CK: −5 $-375 + 275 + 20 \le 0$ T

−1 $-3 + 11 + 4 \le 0$ F

.25 $3(.25)^3 + 11(.25)^2 - 1 \le 0$ T

1 $3 + 11 - 4 \le 0$ F

$x \le -4$ OR $0 \le x \le \frac{1}{3}$