Success for English Language Learners

Solving Quadratic Inequalities

Steps for Success

Step I Introduce the lesson using the following procedure.

- Ask students to imagine that they run a business selling items such as televisions. Ask them to think about how they would determine whether their business was making enough money. How would they figure out how many televisions they would need to sell at a certain price to make a profit? After students have shared their ideas, guide them to realize that a quadratic equation can relate profit to number of purchasers. Show students a graph with a parabola. Explain which area of the parabola would represent profit.

Step II Make sure students understand the important concepts of the lesson by using the following procedure.

- Have students create a web, putting the phrase Solving Quadratic Inequalities in the middle of the organizer. Students can list various reasons for solving quadratic inequalities, such as figuring out the profit or determining how many you need to sell to make money. Students could also list ways to solve quadratic inequalities (graphs, tables), sample equations, or tips for solving.

Step III Ask English Language Learners to complete the worksheet for this lesson.

- Point out that Example 1 in the student textbook is supported by Problem 1 on the worksheet. Help students recognize that the area below the parabola should be shaded because the solution has *y*-values that are less than those on the parabola for corresponding *x*-values. Show students how to test to verify the solution region. Encourage them to test several points.
- Think and Discuss supports the problems on the worksheet.

Making Connections

- Create a problem-solving application as in Example 4 for a real-life product. After you help students determine how much of a certain product would need to be sold to make a profit, encourage them to evaluate the feasibility of such a product. Would it be worth manufacturing? Why or why not? Prompt discussion on businesses and the decisions that businesses must make as they create products.

Name _____ Date _____ Class _____

LESSON 5-7

Success for English Language Learners

Solving Quadratic Inequalities

Problem 1

Graph $y < -2x^2 - 4x + 6$.

Step 1: Find if the graph opens upward or downward.

$f(x) = -2x^2 - 4x + 6$

$a = -2$ $b = -4$ $c = 6$

$a = -2$. -2 is negative. The graph opens down.

Step 2: Find the axis of symmetry.

$$x = -\frac{b}{2a} = -\frac{(-4)}{2(-2)} = \frac{-4}{-4} = -1$$

The axis of symmetry is $x = -1$.

Step 3: Find the vertex.

$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$

You know $-\frac{b}{2a} = -1$.

$(-1, f(-1))$

$f(-1) = -2(-1)^2 - 4(-1) + 6 = -2 + 4 + 6 = 8$

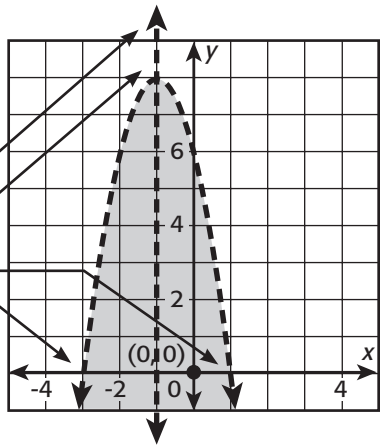
The vertex is $(-1, 8)$.

Step 4: Find the *x*-intercepts.

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - (4)(-2)(6)}}{2(-2)}$$

Step 5: Graph the inequality.

- sketch the axis of symmetry
- plot the vertex
- plot the *x*-intercepts



Step 6: Shade below the parabola.

The $<$ symbol in $y < -2x^2 - 4x + 6$ tells you to shade *below*.

Think and Discuss

1. What point in the shaded area would be the easiest test point to check? Why?

_____

2. Why is the parabola drawn with a dotted line?

_____

Lesson 4-4

1. If A is a matrix it denotes determinant, if A is a number it denotes absolute value.
2. Using Cramer's Rule, the determinant can be used to solve systems of equations.

Lesson 4-5

1. If it is not square, then $AA^{-1} \neq A^{-1}A$.
2. There is no multiplicative inverse of the matrix.
3. It can be used to solve $A \cdot X = B$, where A is a coefficient matrix, X is a variable matrix, and B is a constant matrix.

Lesson 4-6

1. Because they are not coefficients of variables.
2. Answers may vary.

CHAPTER 5

Lesson 5-1

1. The graph moves right/left.
2. The graph moves up/down.
3. The y-coordinates of all points on the graph would change sign.

Lesson 5-2

1. Because $f(4) = 6$.
2. It opens up when $a > 0$.

Lesson 5-3

1. If a point on the graph is reflected across the axis of symmetry, the image is also on the graph.
2. Because a quadratic function can go up, then down; a linear function only goes up or down.

Lesson 5-4

1. Because the square root introduces the plus/minus sign.
2. Because you are changing the equation into a square plus a constant term.

Lesson 5-5

1. It is the square root of -1. It is used to work with negative square roots.
2. You could substitute the answer in the original equation.

Lesson 5-6

1. Because the square root is positive.
2. c would be 0 and the roots would be 0 and -10.

Lesson 5-7

1. The point $(0, 0)$ involves the least amount of calculation.
2. It is dotted because in the problem it is a less than sign, not a less than or equal to sign.

Lesson 5-8

1. The difference between the x-values is constant.
2. Between 4 and 6 the graph is at 9, goes down, and comes back up to 9. The vertex must be between 4 and 6.
3. It opens up because all the y-values are at least 9.

Lesson 5-9

1. Quadrant II, because it corresponds to the point $(-9, 1)$.
2. The additive inverses of 10 and $-4i$.