

Chapter 9 Notes

9.1 Linear Inequalities in 2 Variables

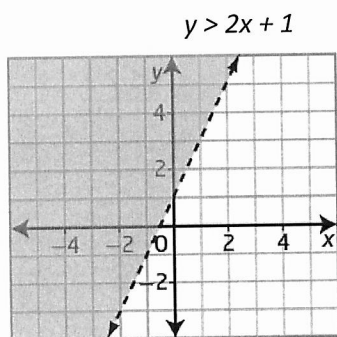
To graph inequalities:

1. Graph the **boundary line**.

- the line is *solid* if _____
- the line is *dashed/dotted* if _____

2. Choose a **check point**...a point that does *not* lie on the boundary line. If that point satisfies the equation, **shade** the portion which includes the check point. If the check point does not satisfy the equation, **shade** on the other side of the boundary line. (Note: Typically a good check point is () except when _____)

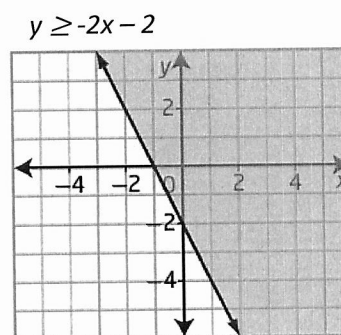
Examples of Solution Regions and Boundary Lines



The boundary line is $y = 2x + 1$

The line is _____ because _____

Check Pt:



The boundary line is $y = -2x - 2$

The line is _____ because _____

Check Pt:

Graphing Linear Equations

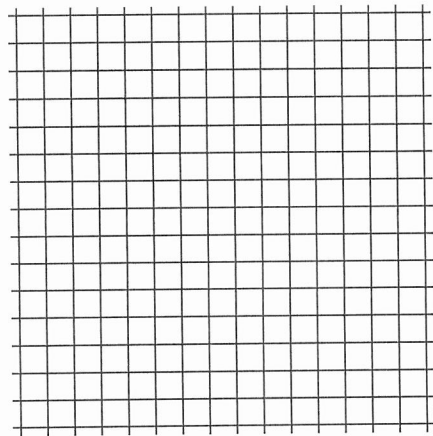
- Slope/Intercept Method ($y = mx + b$)
- Find the x and y intercepts. (x-intercept: let $y = 0$, y-intercept: let $x = 0$)
- Table of values (very tedious)

Reminder: When multiplying or dividing both sides of an inequality by a negative value, you **must**

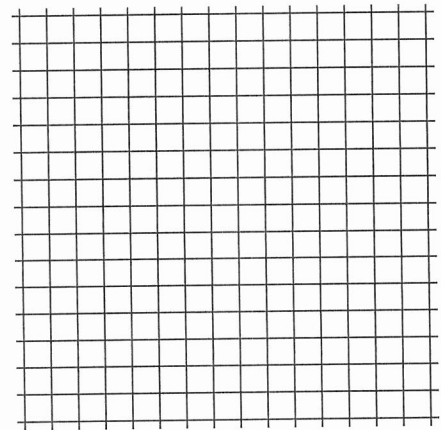
_____.

example: Given $x - 5y > 15$, solve for "y".

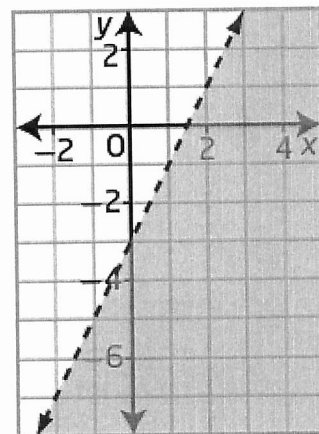
Example 1: Graph $4x + 2y \geq 10$. Is $(1, 3)$ part of the solution?



Example 2: Graph $5x - 20y < 0$. Use a test point to determine what should be shaded.



Example 3: Write an inequality to represent the graph at right.



Assignment:

9.2 Quadratic Inequalities in 1 Variable

Linear equations have a degree of _____ and graph as _____.

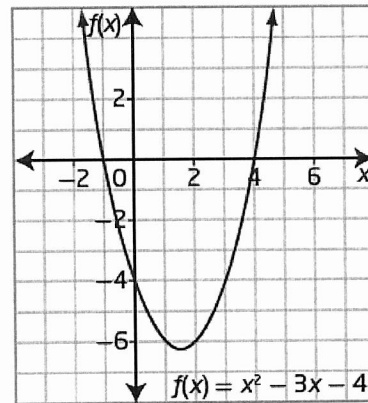
Quadratic equations have a degree of _____ and graph as _____.

In quadratic equations, **solving** means to find the _____, _____, _____ or _____.

Investigate

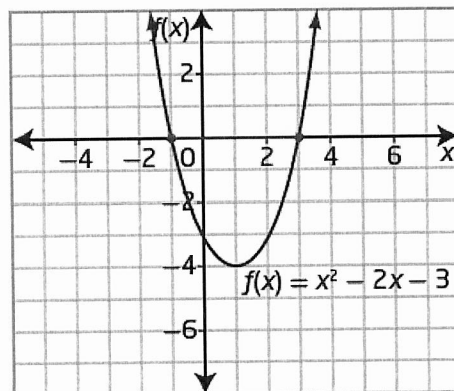
Given $f(x) = x^2 - 3x - 4$ (graphed at right):

- what are the **zeroes** of this function?
(what are the x-intercepts?)
- for what values of x will $x^2 - 3x - 4 > 0$?
(where is the graph greater than 0?)
- for what values of x will $x^2 - 3x - 4 < 0$?
(where is the graph less than 0?)



Example: Given the graph of $f(x) = x^2 - 2x - 3$, what is the solution to:

- $x^2 - 2x - 3 < 0$?
- $x^2 - 2x - 3 \leq 0$?
- $x^2 - 2x - 3 > 0$?
- $x^2 - 2x - 3 \geq 0$?



Assignment:

9.2 Quadratic Inequalities in 1 Variable

To solve quadratic inequalities when you're not given a graph, use sign analysis.

- Steps:
- 1) Rewrite the inequality with 0 on one side
 - 2) Factor (make sure that factors have a positive x)
 - 3) Draw a number line with ***all*** the factors listed
 - 4) Decide which values make the factor zero, positive, and negative (0, + and -)
 - 5) Multiply the signs together
 - 6) Write a solution using proper notation

Example: Solve $x^2 - 3x - 4 > 0$ using sign analysis

Example: Solve $x^2 - 2x - 3 \leq 0$ using sign analysis

Example: Solve $-x^2 + x + 12 < 0$ using sign analysis

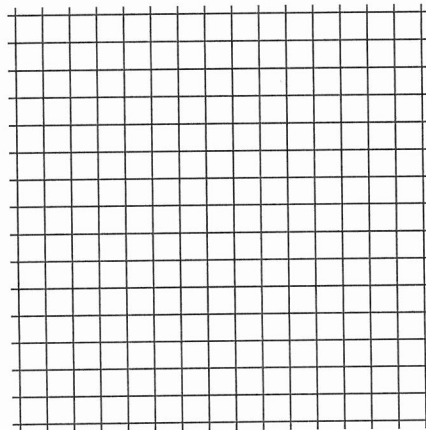
Example: Solve $2x^2 - 5x > 12$ using sign analysis

Assignment:

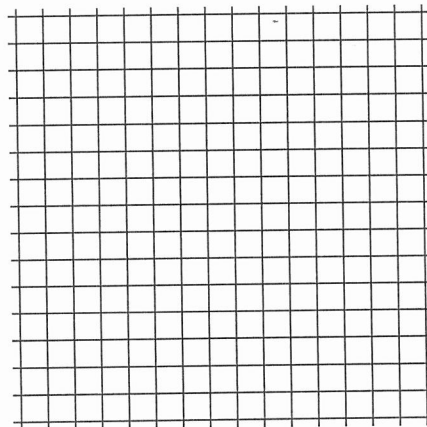
9.3 Quadratic Inequalities in Two Variables

- Steps:
1. Graph the quadratic equation (parabola)
 2. Decide if the boundary is solid (\leq , \geq) or dashed ($<$, $>$)
 3. Use a test point to determine which region is the solution. Shade either *inside* the parabola or *outside* of the parabola.

Example: Graph $y < -2(x - 3)^2 + 8$. Determine if $(2, -4)$ is a solution.



Example: Graph $y \leq x^2 - 4x - 5$. Identify one ordered pair that is a solution.



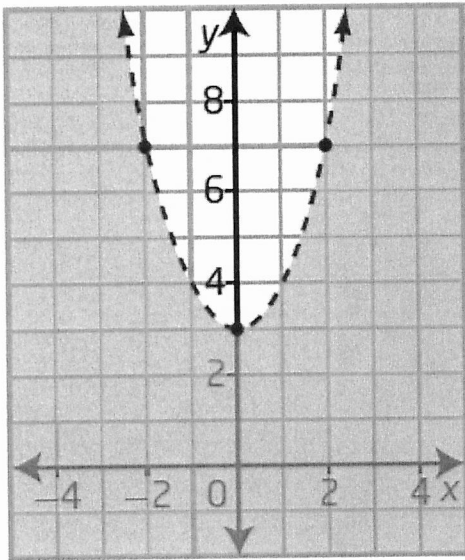
Assignment:

9.3 Quadratic Inequalities in Two Variables

Writing Quadratic Inequalities

- Determine the vertex
- Find one point on the parabola
- Substitute the vertex point (p, q) and the other point (x, y) into $y = a(x - p)^2 + q$ and solve for "a"
- Write an *equation* which suits these points
- Now choose a point which lies in the shaded region and determine which *inequality sign* is appropriate.

Example 1



Example 2:

A satellite dish is 60 cm in diameter and 20 cm deep. The dish has a parabolic cross-section. Locate the vertex of the parabolic cross section at the origin and sketch the parabola that represents the dish. Determine the inequality that shows the region from which the dish can receive a signal.

Assignment: