

7.5 Systems of Inequalities

Before we solve systems of linear inequalities we must first know how to graph a single linear inequality.

For the most part, graphing inequalities is exactly like graphing equation with a couple of exceptions.

1. Our line may be dotted or solid.
2. We must shade parts of our coordinate plane.

In an inequality the line graphed forms a boundary line between two half-planes. One region contains all the ordered pairs that make the inequality true. The other region, false.

Two general rules when graphing:

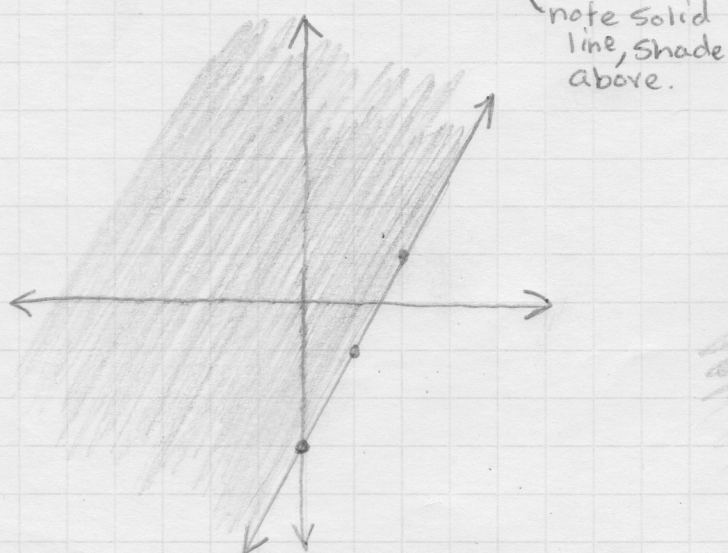
1A. \geq or \leq get a solid line.

1B. $>$ or $<$ get a dotted line.

2A. \geq or $>$ shade above line

2B. \leq or $<$ shade below

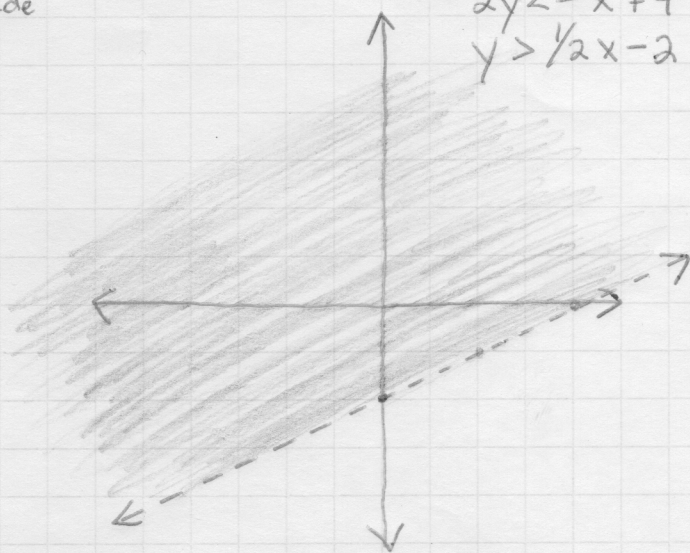
Example #1: Graph $y \geq 2x - 3$



Example #2: Graph

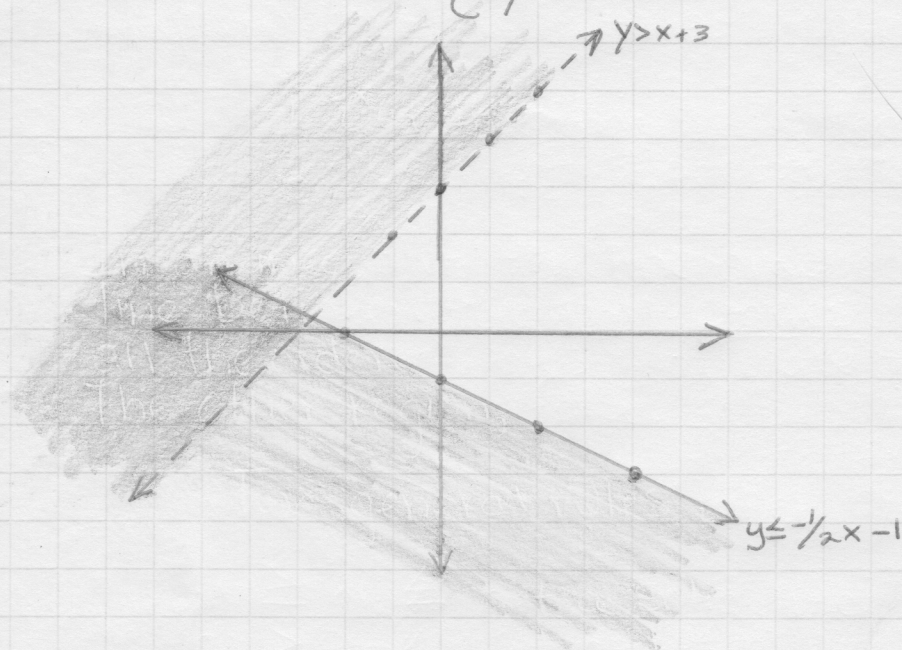
* Dotted line

$$\begin{aligned} x - 2y &< 4 \\ -2y &< -x + 4 \\ y &> \frac{1}{2}x - 2 \end{aligned}$$



For a system of inequalities, each inequality must be graphed and shaded separately. The overlapping shaded region (the intersection) contains coordinates or ordered pairs that satisfy both inequalities.

Example #1 $\begin{cases} y \leq -\frac{1}{2}x - 1 \\ y > x + 3 \end{cases}$



Example #2 Let's try a word problem.

Kara wants to earn at least \$126 per week by working part time. She makes \$6/hr doing yard work and \$7/hr working at the library, but she can't work more than 30 hrs/week.

Write a system that represents Kara's situation, and find all the possible combinations of hours and jobs she can work.

Let m = yard work hours

Let n = library hours

Situation #1 $m + n \leq 30$

Situation #2 $6m + 7n \geq 126$

$$m + n \leq 30$$

$$n \leq -m + 30$$

$$6m + 7n \geq 126$$

$$7n \geq -6m + 126$$

$$n \geq -\frac{6}{7}m + 18$$

Any point inside the shaded region works
(4, 20) (15, 10) (10, 15)

