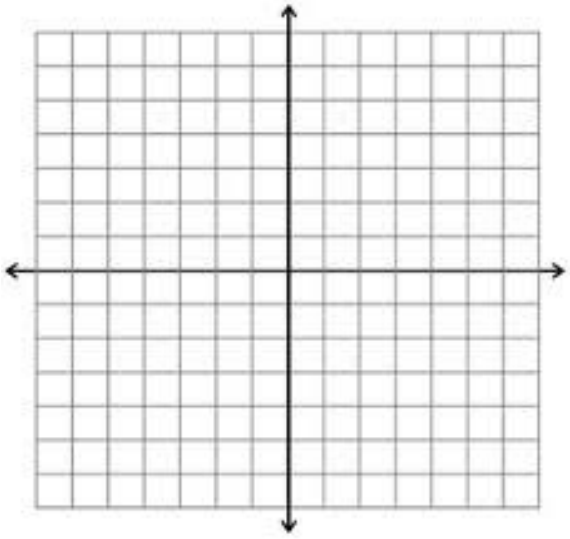
9.4 Linear Inequalities in Two Variables

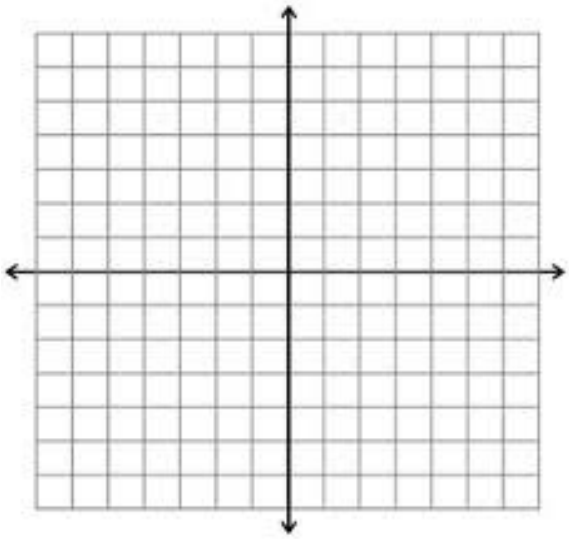
Method:

1. Replace the inequality symbol with an equal sign and graph the equation. Use a dashed line if the symbol is $<$ or $>$ and a solid line otherwise.
2. Decide on which side of the line to shade.
   (a) Choose a test point. If the inequality evaluated at the point is true, graph on the side that contains the test point; otherwise, graph the other side.
   (b) If the inequality is solved for y, shade based on the inequality symbol. Shade below the line if you have $y < \ldots$ and shade above the line if you have $y > \ldots$.

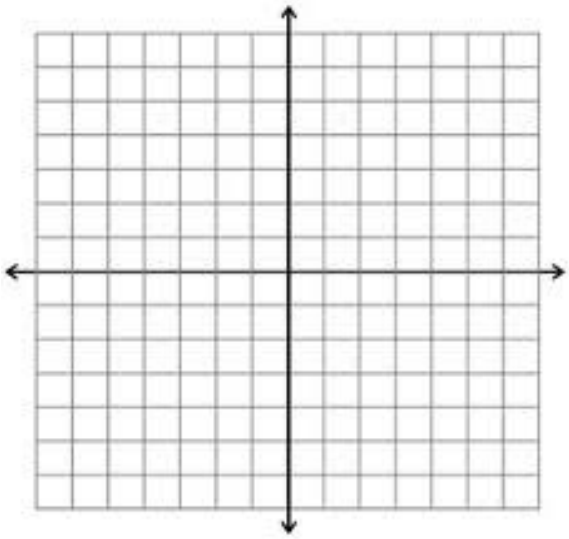
Example 9.4.1. Graph: $4x - 2y \geqslant 8$



Example 9.4.2. Graph: $y > \frac{-3}{4}x$



Example 9.4.3. Graph: $x \leqslant -2$

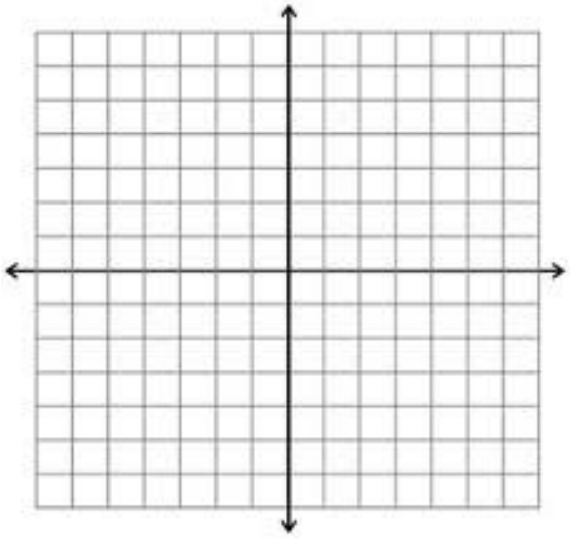


Graphing Systems of Inequalities

Systems of linear inequalities have a *solution set* that is a portion of the plane, not just a point. To find this solution set, graph each of the inequalities individually and look for the overlap (intersection) of their solutions.

Example 9.4.4. Graph the solution set of the following system:

$$\begin{cases} x - 3y < 6 \\ 2x + 3y \geqslant -6 \end{cases}$$



Example 9.4.5. Graph the solution set of the following system:

$$\begin{cases} x + y < 2 \\ -2 \leqslant x < 1 \\ y > -3 \end{cases}$$