Pre-calculus  

Graphing Linear Inequalities

1. Graph the inequality as if the inequality were an equation, 
i.e. convert the order symbol to an equal sign and graph the line. 
The line is the boundary of the inequality.

If the inequality symbol includes an equal sign, e.g. \(\leq\) or \(\geq\), then make the line solid;

If the inequality symbol does not include an equal sign, e.g. \(<\) or \(>\), then make the line dotted or
dashed \((-\cdots-\cdot-\cdot-\cdot-\cdot-\cdot-\cdot-\cdot-)\)

The solid line means the solution of the inequality includes the line, the dotted or dashed line means
the line is not part of the solution of the inequality.

2. If the boundary line does not include the origin \((0, 0)\), determine whether \((0, 0)\) satisfies the
inequality, i.e. substitute 0 for \(x\) and \(y\) and determine if the inequality is true.

If \((0, 0)\) works, then shade that side of the inequality boundary line that contains \((0, 0)\).
Every point on that side (half-plane) works in the inequality and is a solution to the inequality.

If \((0, 0)\) does not work in the inequality, then shade the other side of the inequality boundary line,
i.e. shade the side (half-plane) that does not contain \((0,0)\).

If the boundary line contains the origin \((0,0)\), then pick another point on one side of the boundary
line and determine whether that point satisfies the inequality. Then shade the appropriate
side (half-plane).

2. Alternative to picking a point:
if \(y > \) or \(y \geq\), then shade above the line; if \(y < \) or \(y \leq\), then shade below the line.

The inequality must be in \(y = \) form in order to use this method.

Example: \(7x + 5y \geq 35 \quad \rightarrow \quad 5y \geq -7x + 35 \quad \rightarrow \quad y \geq -\frac{7}{5}x + 7\)

\(\geq\) means the line is solid

Substituting \((0,0):\quad 7(0) + 5(0) \neq 35\)

Therefore shade the half-plane without \((0,0)\)

The same analysis applies to graphing inequalities involving parabolas or other polynomial functions.