Section 4.5 Graphing Linear Inequalities in Two Variables

Recall that a linear equation in two variables is an equation that can be written in the form $Ax+By=C$ where $A$, $B$, and $C$ are real numbers and $A$ and $B$ are not both $0$.

A **linear inequality in two variables** is an inequality that can be written in one of the following forms:

$Ax+By<C$ $Ax+By>C$

$Ax+By\leq C$ $Ax+By\geq C$

where $A$, $B$, and $C$ are real numbers and $A$ and $B$ are not both $0$.

An ordered pair is a solution of an inequality in $x$ and $y$ if replacing the variables with the coordinates of the ordered pair results in a true statement.

# Objective 1: Graphing Linear Inequalities in Two Variables

Consider the linear equation $x-y=1$ which is graphed below. Recall that all points on the line defined by $x-y=1$ correspond to ordered pairs that are solutions to the equation.

Notice the line defined by $x-y=1$ divides the coordinate plane into two **half-planes**. All points on one side of the line are solutions to the inequality $x-y<1$. All points on the other side of the line are solutions to the inequality $x-y>1$. The line that separates these two regions, in this case the line defined by $x-y=1$, is called the **boundary line**.



a. Show that the ordered pair $(0,0)$ is a solution to the inequality $x-y<1$.

b. Show that the ordered pair $(2,-2)$ is a solution to the inequality $x-y>1$.

When graphing the solution set of a linear inequality in two variables, if the inequality sign is $>$ or $<$, then the points on the boundary line are not part of the solution set, so the boundary line is dashed. If the inequality sign is $\leq $ or $\geq $, the points on the boundary line are part of the solution set, so the boundary line is solid.

Graph the linear inequality.

|  |  |
| --- | --- |
| c. $x+y>5$ Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. | d. $3x-4y\geq 12$Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. |
| e. $5y\leq -x+5$ Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. | f. $2x-3y<0$Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. |

|  |  |
| --- | --- |
| g. $x\leq 3$ Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. | h. $y>-2$Blank coordinate plane that spans from negative ten to positive ten on each axis with a scale of one unit. |