7.1 Linear Inequalities

Wednesday, May 13, 2020 5:46 PM

less than $<$ | less than or equal to $\leq$ | greater than or equal $\geq$ | greater than $>$

7.1 Linear Inequalities in Two Variables

A linear inequality in two variables may be in one of the following forms:

$Ax + By > C$ $\quad Ax + By < C$

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

Where A, B, and C are real numbers

An inequality in two variables describes a region in the Cartesian plane. Any point (x, y) that satisfies the inequality is a solution to the inequality. The set of all points that satisfy the inequality is called the solution set or solution region.

Example 1: Which points are solutions to the given inequality?

$3x - 2y \geq -16$ $\qquad \{(-3, 4), (0, 2), (-5, 3)\}$ (x y)

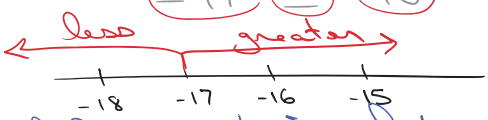
You try: $(-5, 3)$

check $(-3, 4)$

$3(-3) - 2(4) \geq -16$

$-9 - 8 \geq -16$

$-17 \geq -16$



false: not in solution region.

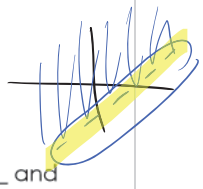
check $(0, 2)$

$3(0) - 2(2) \geq -16$

$-4 \geq -16$

true: $(0, 2)$ is part of solution set.

The line related to the linear equality $Ax + By = C$ is the boundary that divides the Cartesian plane into two possible regions. ($Ax + By < C$)



- When the inequality sign is $\geq$ or $\leq$, the points on the boundary are included and the graph has a solid boundary line.
- When the inequality sign is $>$ or $<$, the points on the boundary are not included and the graph has a dashed/dotted boundary line.

Pre-Calc 11

Steps to graphing a linear inequality in two variables:

1) Determine if the boundary line is: solid or dashed ($\leq, \geq$; $<, >$)
2) Graph boundary line: get into slope-intercept form.
3) Pick a test point (any point not on boundary line)
4) Shade the appropriate region: where test points satisfy (true) the inequality.

Example 2: Graph $2x + 3y \leq 6$ — solid

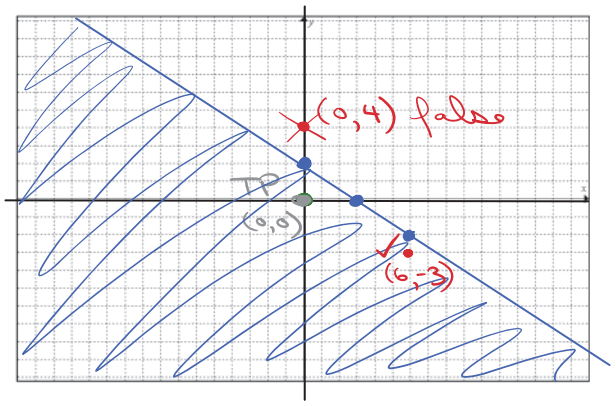
T.P. (0,0)
$2(0) + 3(0) \leq 6$
$0 \leq 6$
True: shade side of boundary line with T.P.

$-2x \quad -2x$

$\frac{3y}{3} \leq \frac{-2x}{3} + \frac{6}{3}$

$y \leq -\frac{2}{3}x + 2$

$m = -\frac{2}{3} \quad b = 2$



Example 3: Graph $5x - 20y < 0$ — dashed

TP (0,1)
$5(0) - 20(1) < 0$
$-20 < 0$
true: shade TP side.

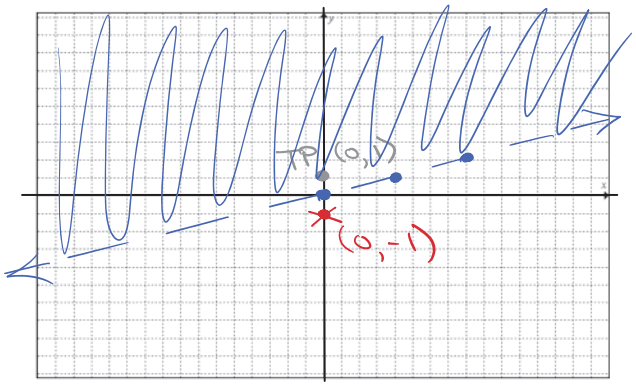
$-5x \quad -5x$

$\frac{-20y}{-20} < \frac{-5x}{-20}$ ÷5

$y > \frac{1}{4}x$

$m = \frac{1}{4} \quad b = 0$

TP (0,-1)
$5(0) - 20(-1) < 0$
$20 < 0$ false



Pre-Calc 11

Example 4: Write an inequality to represent the following graph.

① y-int = b = −6

slope = m = $\frac{2}{3}$

$y \geq \frac{2}{3}x - 6$

② Choose TP (0,0) from solution region.

$y \square \frac{2}{3}x - 6$

$(0) \square \frac{2}{3}(0) - 6$

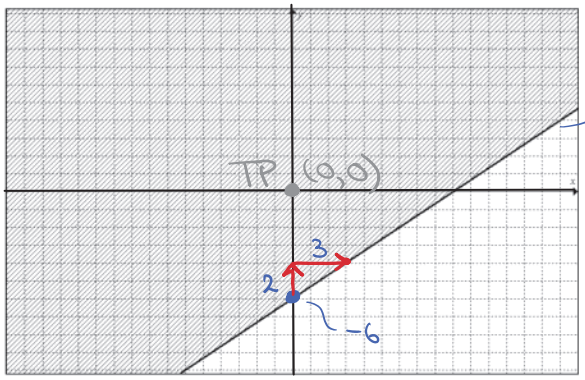
$0 \geq -6$

$y \geq \frac{2}{3}x - 6$ or $3\left(y \geq \frac{2}{3}x - 6\right)$

$3y \geq 2x - 18$

$-2x \quad -2x$

$3y - 2x \geq -18$



≤ ; ≥

Example 5: Write an inequality to represent the following graph.

b = 2 $\quad m = \frac{-2}{1}$ or −2

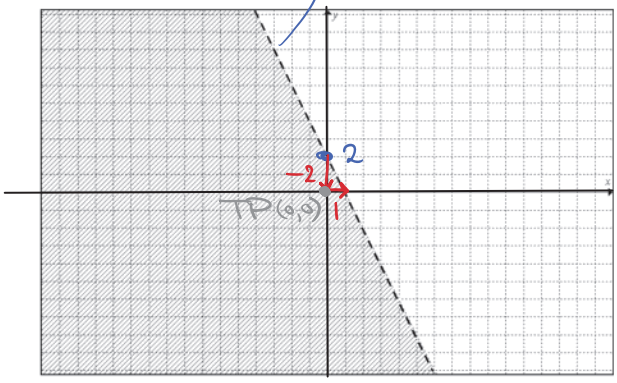
$y \square -2x + 2$

TP (0,0)

$(0) \square -2(0) + 2$

$0 < 2$

$y < -2x + 2$



< or >

Practice: p. 472 # 1a, 2a, 3de, 9 (use graph paper)

Pre-Calc 11