

4.1: Linear Inequalities in Two Variables.
(e.g. the shaded region).

ex 1: Graph $y \geq 4x - 5$

① Graph $y = 4x - 5$

*

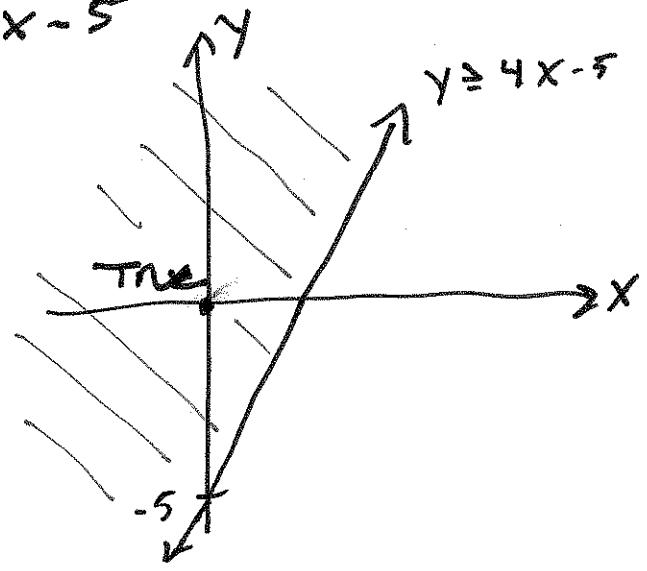
② Test point NOT ON line.

$(0, 0)$

$$0 \geq 4(0) - 5$$

True

③ Shade truth.



ex 2: Graph $y > 4x - 5$

4,1
2/6

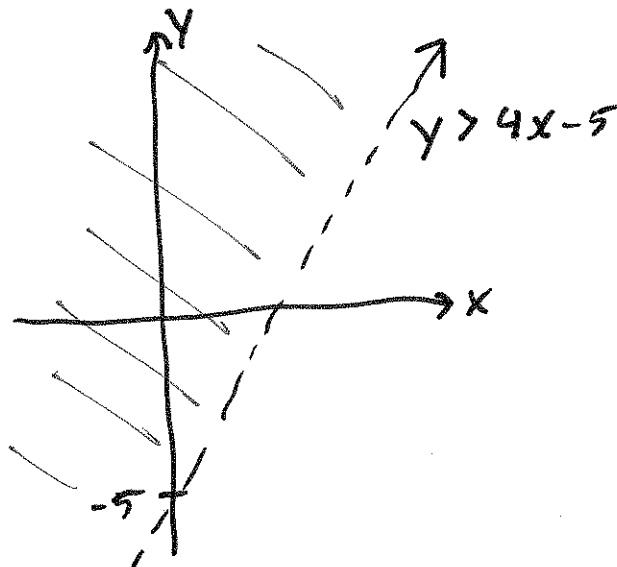
① Graph $y = 4x - 5$

* \geq OR \leq ——— (solid line)

$>$ OR $<$ - - - - - (dashed line).

② Test pt.

③ shade Truth



ex3: Graph $2(x-y) > y+3$

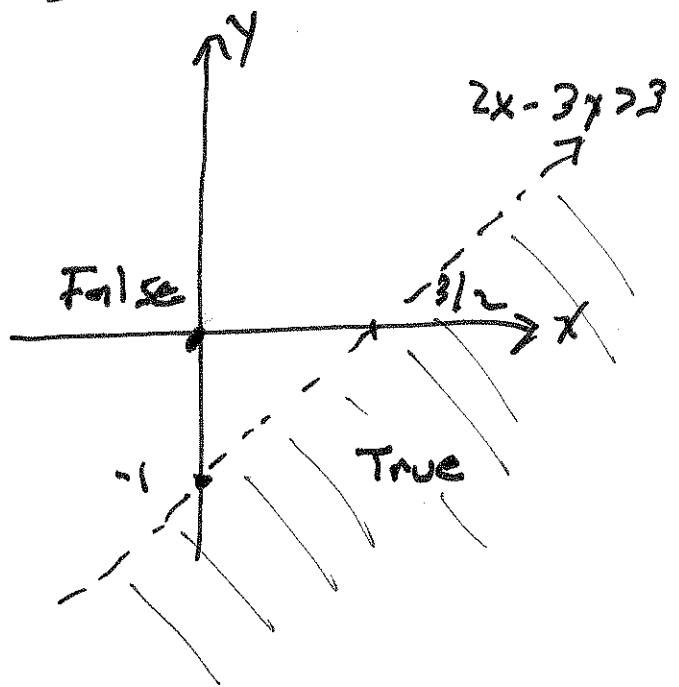
$$\Rightarrow 2x - 2y > y + 3$$

$$\Rightarrow 2x - 3y > 3 \quad (\text{Standard form})$$

Plot the
x, y intercepts.

x	y
0	-1
3/2	0

Test (0,0) False



ex 4:
$$\begin{cases} 4x + 3y \leq 240 & \textcircled{1} \\ 5x - y \leq 110 & \textcircled{2} \\ x \geq 0 \\ y \geq 0 \end{cases}$$
 } 1st quadrant

①

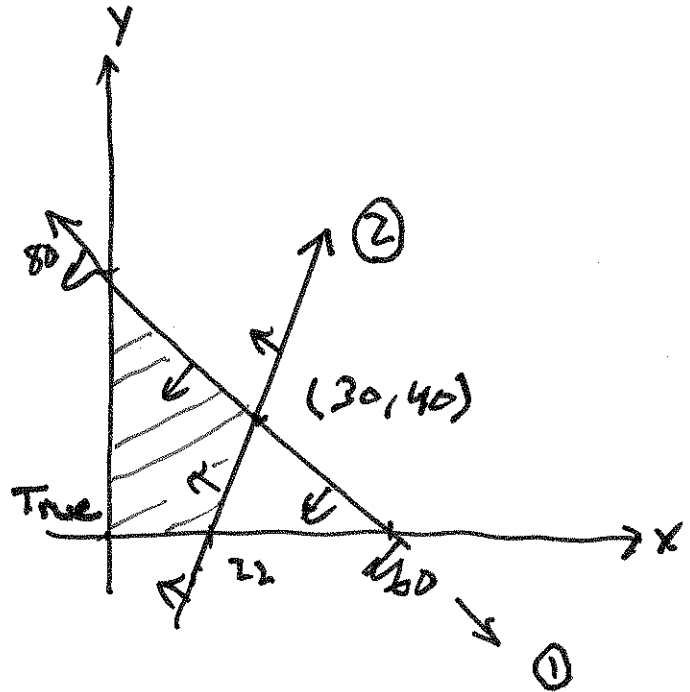
x	y
0	80
60	0

Test (0,0) True

②

x	y
0	-110
22	0

Test (0,0) True



Find intersection pt.

$$\begin{cases} 4x + 3y = 240 \\ 5x - y = 110 \end{cases}$$

$$\begin{aligned} \Rightarrow \left[\begin{array}{cc|c} 4 & 3 & 240 \\ 5 & -1 & 110 \end{array} \right] & \frac{1}{4} R_1 \rightarrow R_1 & \Rightarrow \left[\begin{array}{cc|c} 1 & 3/4 & 60 \\ 0 & 1 & 40 \end{array} \right] \\ & & R_1 - \frac{3}{4} R_2 \rightarrow R_1 \\ \Rightarrow \left[\begin{array}{cc|c} 1 & 3/4 & 60 \\ 5 & -1 & 110 \end{array} \right] & R_2 - 5R_1 \rightarrow R_2 & \Rightarrow \left[\begin{array}{cc|c} 1 & 0 & 30 \\ 0 & 1 & 40 \end{array} \right] \\ \Rightarrow \left[\begin{array}{cc|c} 1 & 3/4 & 60 \\ 0 & -19/4 & -190 \end{array} \right] & -\frac{4}{19} R_2 \rightarrow R_2 & X = 30 \text{ \& } Y = 40 \end{aligned}$$

ex 5: $\begin{cases} 3x - y < 4 & \textcircled{1} \\ 2x - y \geq -3 & \textcircled{2} \end{cases}$ Graph the solution

$\textcircled{1} \quad 3x - y < 4$

x	y
0	-4
4/3	0

Test(0,0): True

$\textcircled{2} \quad 2x - y \geq -3$

x	y
0	3
-3/2	0

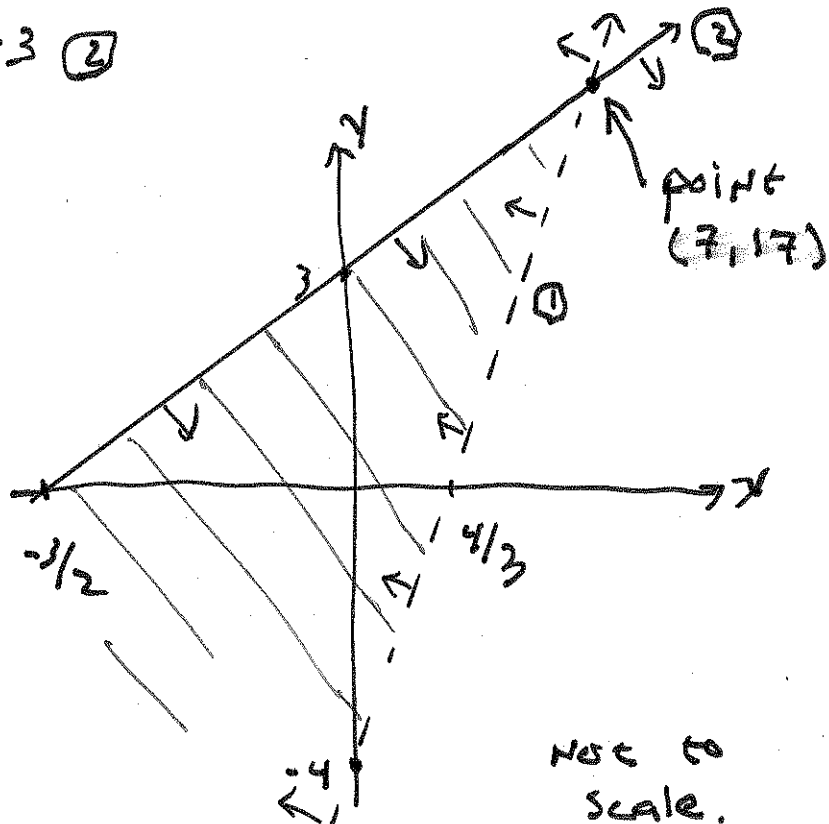
Test (0,0): True

Find the point of intersection by solving the system

$$\begin{cases} 3x - y = 4 \\ 2x - y = -3 \end{cases} \Rightarrow \left[\begin{array}{cc|c} 3 & -1 & 4 \\ 2 & -1 & -3 \end{array} \right]$$

RREF

$$\left[\begin{array}{cc|c} 1 & 0 & 7 \\ 0 & 1 & 17 \end{array} \right]$$



ex 6: Graph the solution

$$\begin{cases} x + 3y \geq 6 & \textcircled{1} \\ 2x + 4y \geq 10 & \textcircled{2} \\ 3x + y \leq 5 & \textcircled{3} \\ x \geq 0 ; y \geq 0 \end{cases}$$

①

x	y
0	2
6	0

②

x	y
0	2.5
5	0

③

x	y
0	5
5/3	0

Test (0,0) each inequality
 (0,0) **False**
 (0,0) **False**
 (0,0) **True**

Look for the intersection of ② & ③

↓ (0, 2.5)

$$\begin{bmatrix} 2 & 4 & | & 10 \\ 3 & 1 & | & 5 \end{bmatrix}$$

RREF

$$\begin{bmatrix} 1 & 0 & | & 1 \\ 0 & 1 & | & 2 \end{bmatrix}$$

