INEQUALITIES 2

1. Solve the following systems of inequalities:

a) $\left.\begin{array}{l} 4(x+1)-2 \le 0 \\ 2(x+2)-4 \ge 2 \end{array}\right\}$

b) $\left.\begin{array}{l} 3x-2 < 4 \\ 2x+6 > x-1 \end{array}\right\}$

c) $\left.\begin{array}{l} 1-(2x-1) < 0 \\ 3(x+1)-9 \le 0 \end{array}\right\}$

2. Solve the following systems of inequalities:

a) $\left.\begin{array}{l} x+y \le 1 \\ x-y \le 3 \end{array}\right\}$

b) $\left.\begin{array}{l} -x+y \ge -2 \\ \quad y \le 4 \end{array}\right\}$

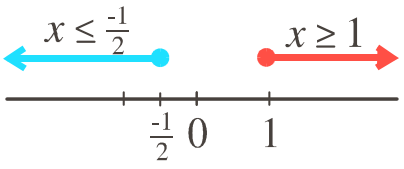
c) $\left.\begin{array}{l} x+y \ge 9 \\ -2x+3y \le 12 \end{array}\right\}$

SOLUTION

1.

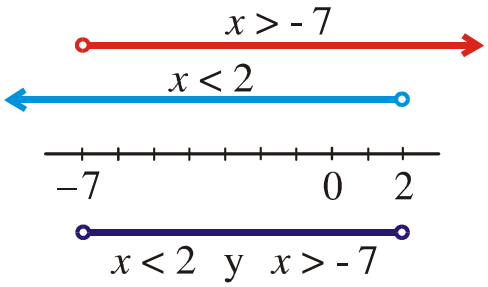
a) $\left.\begin{array}{l} 4(x+1)-2\le 0 \\ 2x+4\ge 6 \end{array}\right\}$ $\left.\begin{array}{l} 4x+4-2\le 0 \\ 2x+4\ge 6 \end{array}\right\}$ $\left.\begin{array}{l} 4x\le -2 \\ 2x\ge 2 \end{array}\right\}$ $\left.\begin{array}{l} x\le \frac{-2}{4} \\ x\ge 1 \end{array}\right\}$ $\begin{array}{l} x\le \frac{-1}{2} \\ x\ge 1 \end{array}$

It does not have any solution



b)

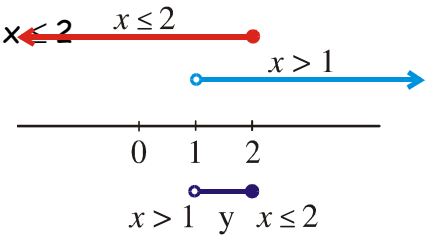
$\left.\begin{array}{l} 3x-2<4 \\ 2x+6>x-1 \end{array}\right\}$ $\left.\begin{array}{l} 3x<6 \\ x>-7 \end{array}\right\}$ $\begin{array}{l} x<2 \\ x>-7 \end{array}$



Solution (both inequalities):
(-7, 2)

c)

$\left.\begin{array}{l} 1-(2x-1)<0 \\ 3(x+1)-9\le 0 \end{array}\right\}$ $\left.\begin{array}{l} 1-2x+1<0 \\ 3x+3-9\le 0 \end{array}\right\}$ $\left.\begin{array}{l} -2x<-2 \\ 3x\le 6 \end{array}\right\}$ $\begin{array}{l} x>1 \\ x\le 2 \end{array}$



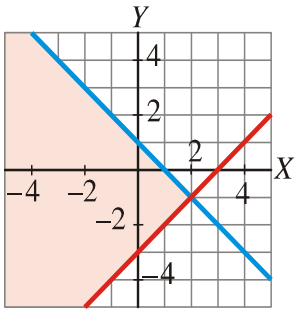
Solution: (1,2]

2.

a) $\left.\begin{array}{l} x+y\le 1 \\ x-y\le 3 \end{array}\right\}$

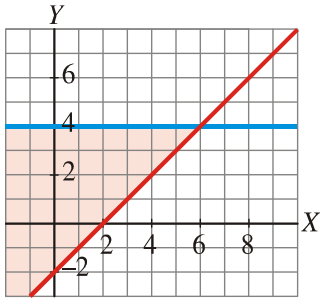
Graphically: $\left\{\begin{array}{ll} x+y-1=0 & (y=-x+1) \\ x-y-3=0 & (y=x-3) \end{array}\right.$ two straight-lines

Trying the point (0, 0) we see both inequalities are satisfied in this point. So, the solution is the pink zone (including the limiting rays)



b) $\left.\begin{array}{l} -x+y \geq -2 \\ y \leq 4 \end{array}\right\}$

Graphically: $\begin{cases} -x+y+2=0 \\ y=4 \end{cases}$ $(y=x-2)$



Trying the point (0, 0) we can see:

$$\begin{cases} 0+0 \geq -2 \\ 0 \leq 4 \end{cases}$$

So, the solution is the pink zone (including the limiting rays)

c) $\left.\begin{array}{l} x+y \geq 9 \\ -2x+3y \leq 12 \end{array}\right\}$ Graphically: $\begin{array}{l} y=9-x \\ y=\dfrac{12+2x}{3} \end{array}$

Trying the point (0, 0) we can see:

$\begin{cases} 0+0 \geq 9 \text{ no!} \\ -2\cdot 0+3\cdot 0 \leq 12 \end{cases}$ so, the solution is the green zone (including the limiting rays)