

### 3.2 – Solving Compound Linear Inequalities

Compound inequalities are inequalities that use "and" or "or". A conjunction uses "and", and a disjunction uses "or".

In a conjunction, if a number is a solution, then it must be true in BOTH inequalities. On the graph, the solution is the section that is drawn twice (the overlap). In a disjunction, if a number is a solution, then it need only be true in either one inequality or the other. It does not have to be true in both. On the graph, the solution is anything that is drawn at all.

Solve and graph the following conjunctions.

Ex. 1  $2 < -x + 3 < 4$

$$\begin{aligned} 2 < -x + 3 &< 4 \\ 2 + x < 3 & \quad -x < 1 \\ x < 1 & \quad x > -1 \end{aligned}$$



Ex. 2  $-7 \leq \frac{3}{4}x - 7 \leq -4$

$$\begin{aligned} 4(-7 \leq \frac{3}{4}x - 7) & \quad (\frac{3}{4}x - 7 \leq -4) \cdot 4 \\ -28 \leq 3x - 28 & \quad 3x - 28 \leq -16 \\ -28 - 3x \leq -28 & \quad 3x \leq 12 \\ -3x \leq 0 & \quad x \leq 4 \\ x \geq 0 & \end{aligned}$$



Ex. 3  $-4 \leq -(x - 1) < 4$

$$\begin{aligned} -4 \leq -(x - 1) &< 4 \\ -4 \leq -x + 1 & \quad -x + 1 < 4 \\ -4 + x \leq 1 & \quad -x < 3 \\ x \leq 5 & \quad x > 3 \end{aligned}$$



Most conjunctions are written like examples 2 and 3. The inequality  $a < x < b$  is read "x is between a and b". A between statement is always written from smallest to largest using less than symbols.

Solve and graph the following disjunctions.

Ex. 4  $x + 7 < 4$  or  $7 - x < 1$

$$\begin{aligned} x < -3 & \quad -x < -6 \\ & \quad x > 6 \end{aligned}$$



Ex. 5  $2x - 1 < -9$  or  $3x - 15 \geq 0$

$$\begin{aligned} 2x < -8 & \quad 3x \geq 15 \\ x < -4 & \quad x \geq 5 \end{aligned}$$



Disjunctions are NEVER written as one statement. They will start out and end up as two separate inequalities with an "or" in between.