Section 2.6. Linear inequalities in two variables

1. Graphing linear inequalities
2. Graphing linear inequalities joined by "and" or "or".
3. Graphing linear absolute value inequalities.

1. A linear inequality in the two variables x and y is an inequality that can be written in the form

$$ax + by < c$$
or
$$ax + by > c$$
or
$$ax + by \leq c$$
or
$$ax + by \geq c,$$

where $a, b,$ and c are constants and a and b are not both 0.

Procedure: (Solving linear inequalities in two variables)

1. Graph the line that results from replacing the inequality symbol with "=".

2. Make the line solid if the inequality symbol is $\leq$ or $\geq$ and dashed if the symbol is $<$ or $>$. A solid line indicates that points on the line are included in the solution set while a dashed line indicates that points on the line are excluded from the solution set.

3. Determine which of the half-planes defined by the boundary line solves the inequality by substituting a test point from one of the two half-planes into the inequality. If the resulting numerical statement is true, all the points in the same half-plane as the test point solve the inequality. Otherwise, the points in the other half-plane solve the inequality.

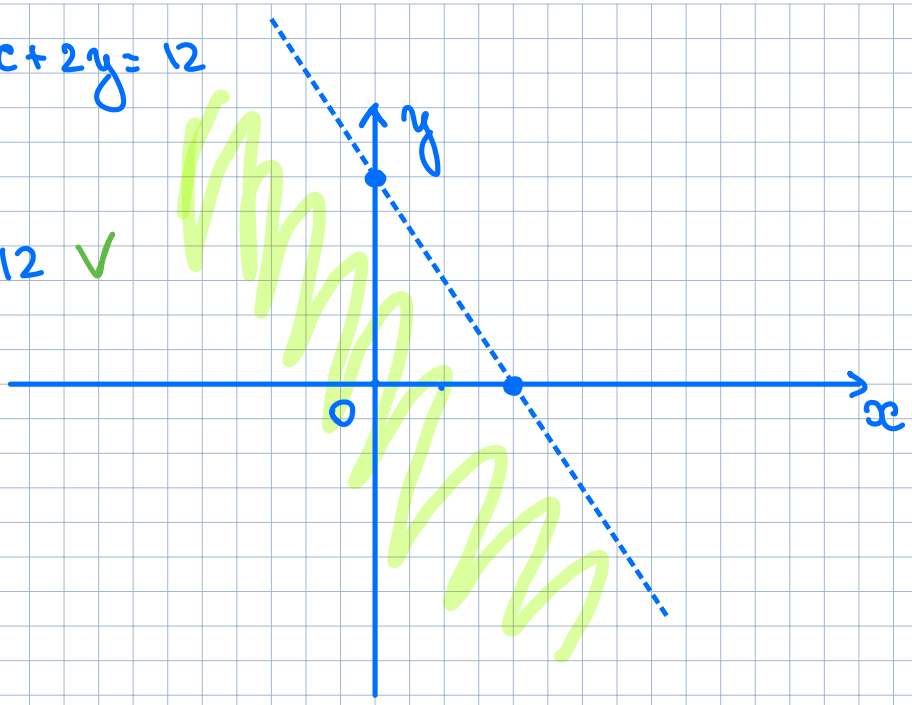
Example

1) $3x + 2y < 12$

$3x + 2y = 12$

$(0,0)$

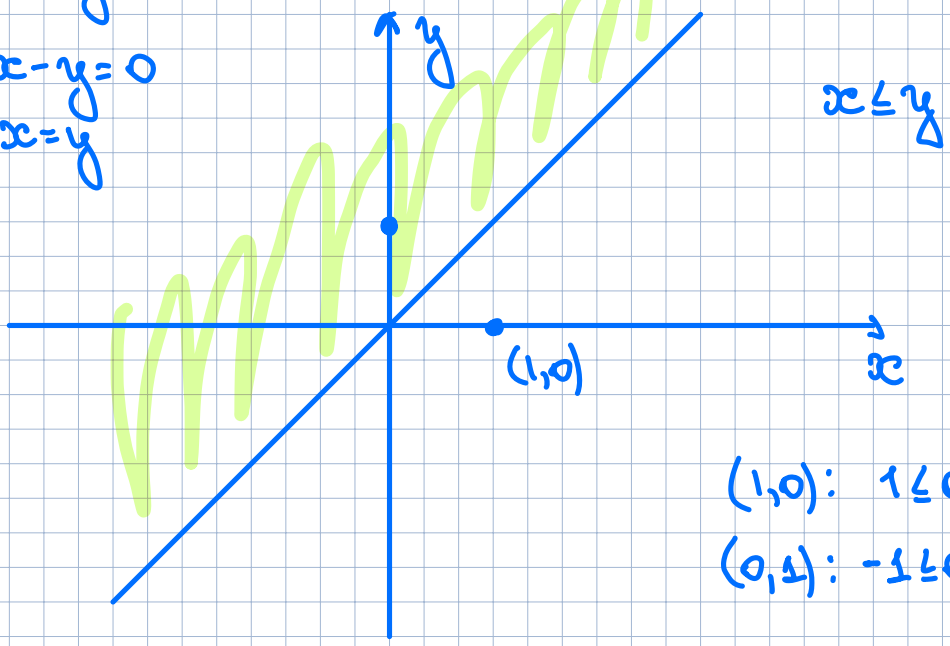
$0 + 0 < 12$ ✓



2) $x - y \leq 0$

$x - y = 0$

$x = y$



$x \leq y$

$(1,0)$: $1 \leq 0$ ✗

$(0,1)$: $-1 \leq 0$ ✓

▼

2. Graphing linear inequalities joined by

"and" or "or".

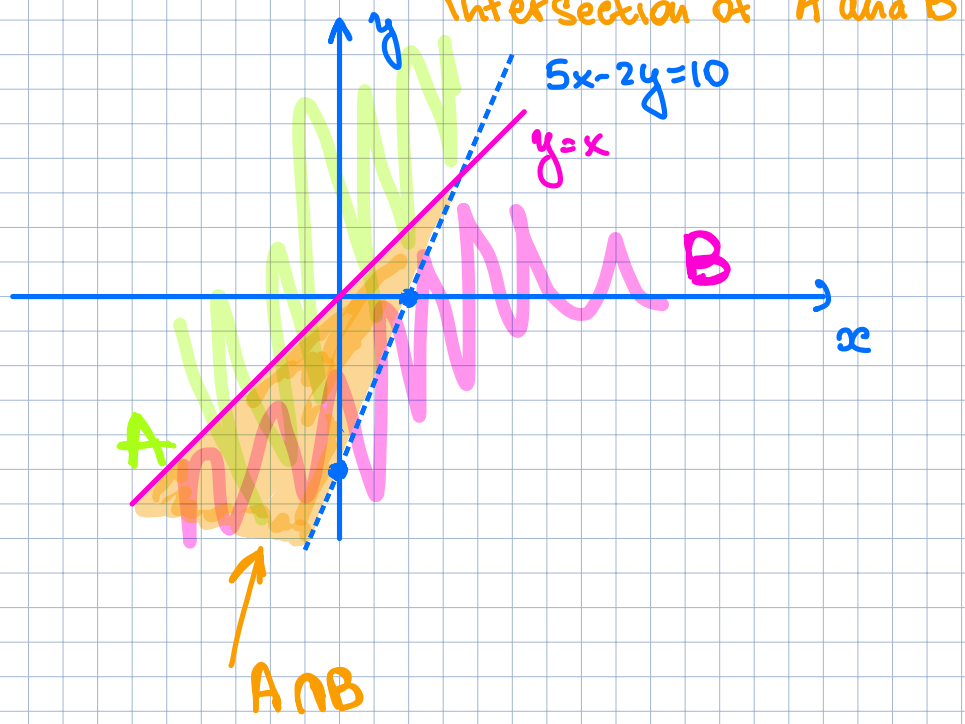
Example

1) $5x-2y<10$ and $y \leq x$

Set A Set B

A and B is $A \cap B$

intersection of A and B



3. Linear absolute value inequalities.

Example

Graph the solution set in $\mathbb{R}^2$

that satisfies the joint conditions

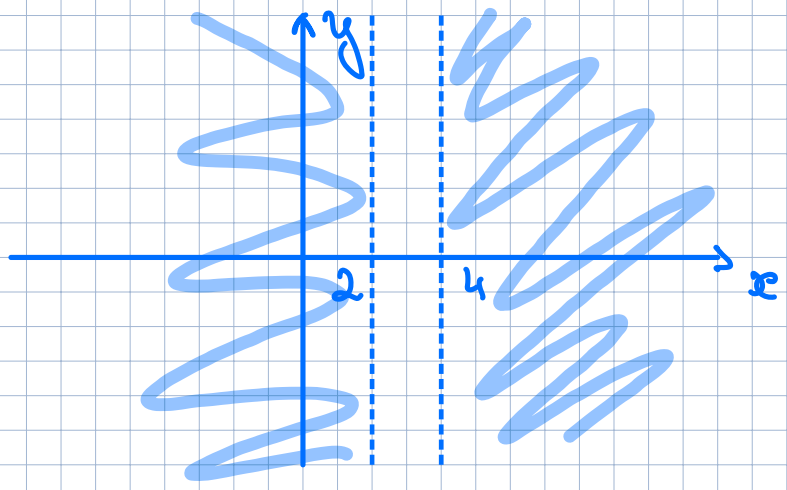
$|x-3| > 1$ and $|y-2| \leq 3$.

Solution:

$|x-3| > 1$

$x-3 > 1$ or $x-3 < -1$

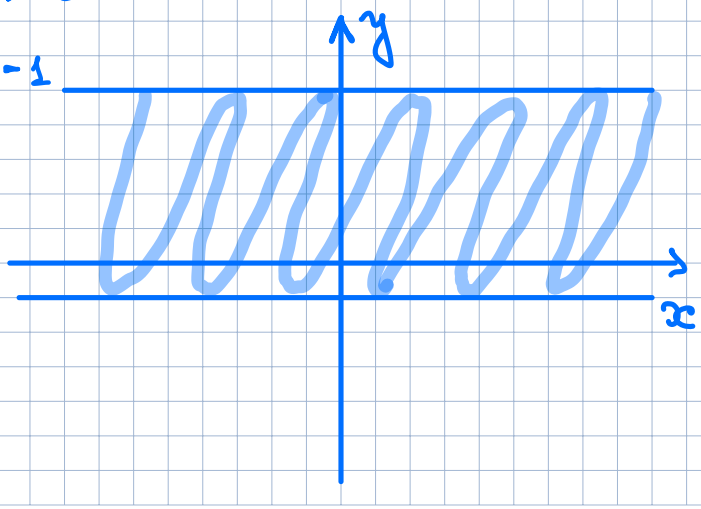
$x > 4$ or $x < 2$



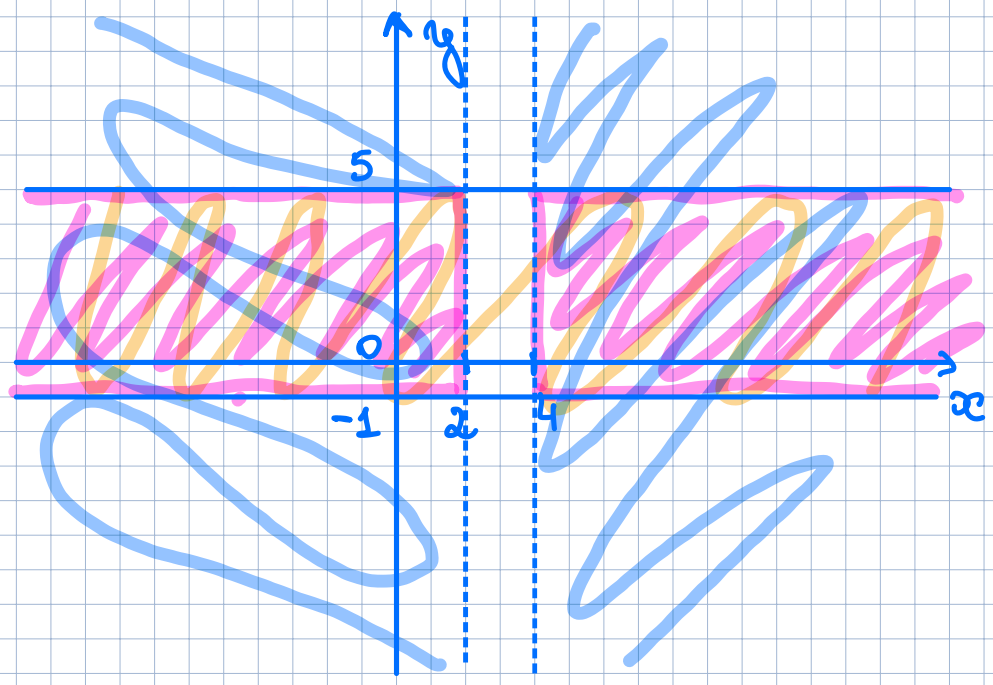
$|y-2| \leq 3$

$y-2 \leq 3$ or $y-2 \geq -3$

$y \leq 5$ or $y \geq -1$



The joint result is



● is a joint result