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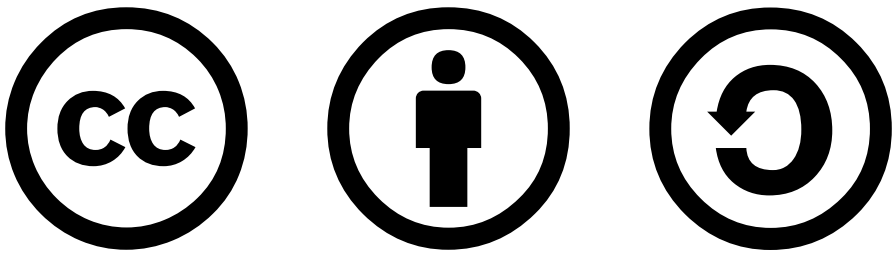


# Algebra Lecture 10

Crista Moreno

December 20, 2016

## Today

1. Systems of Linear Inequalities

What is a System of Linear Inequalities?

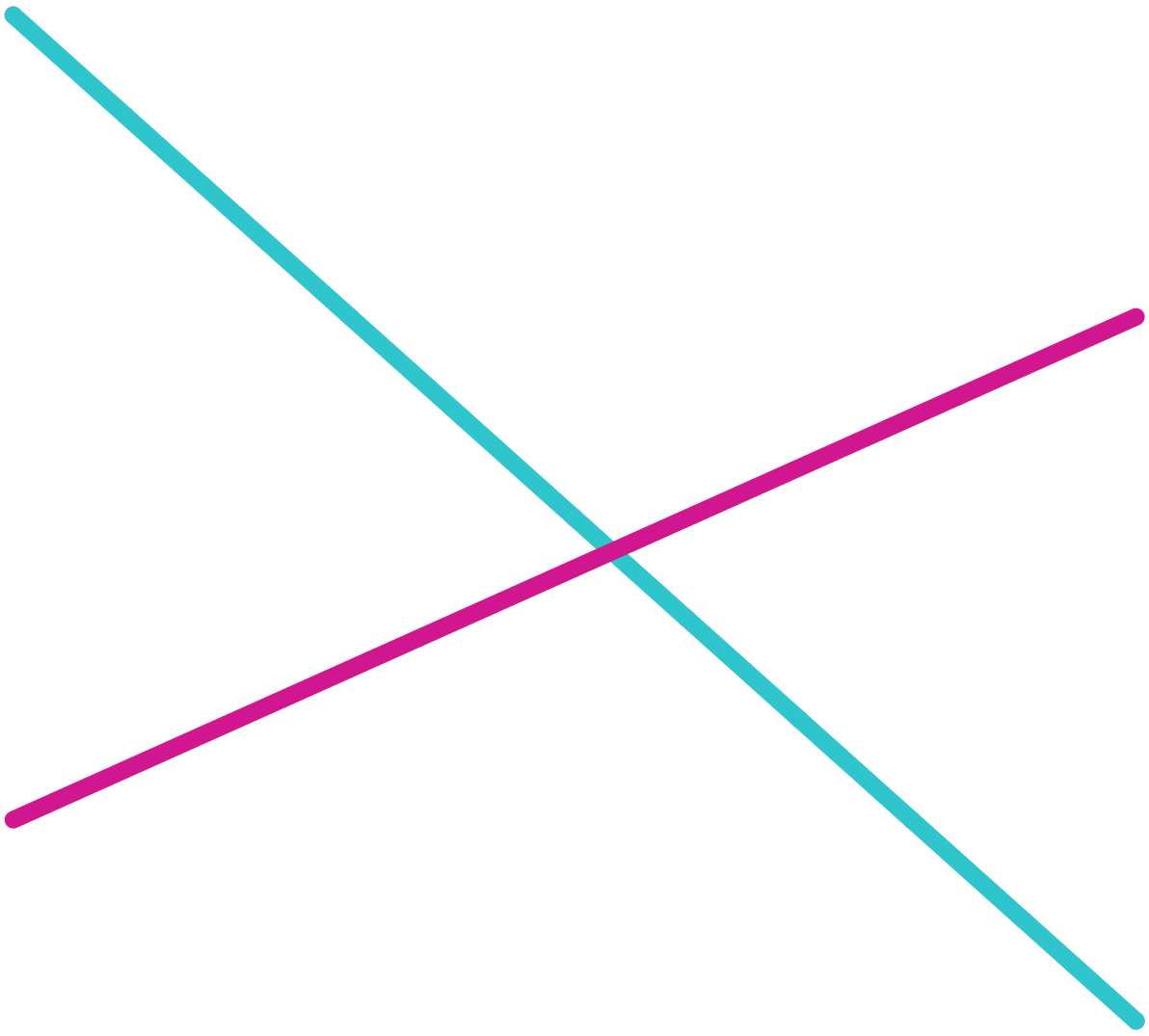
It is a set of Linear Inequalities.

# It is a set of Linear Inequalities.

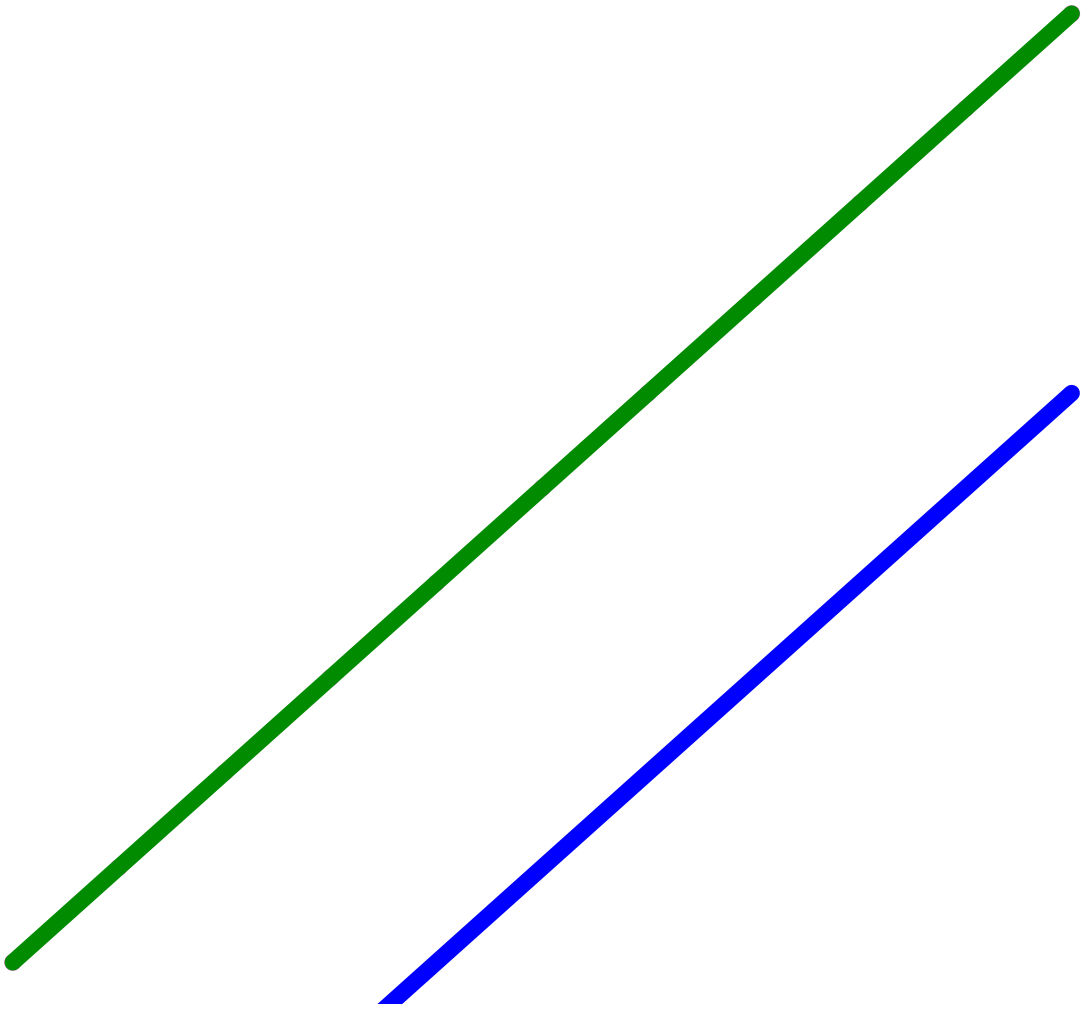
Here, we will consider sets of one or two linear inequalities.

Recall the possible ways in which two lines can be drawn in the plane $\mathbb{R}^2$.

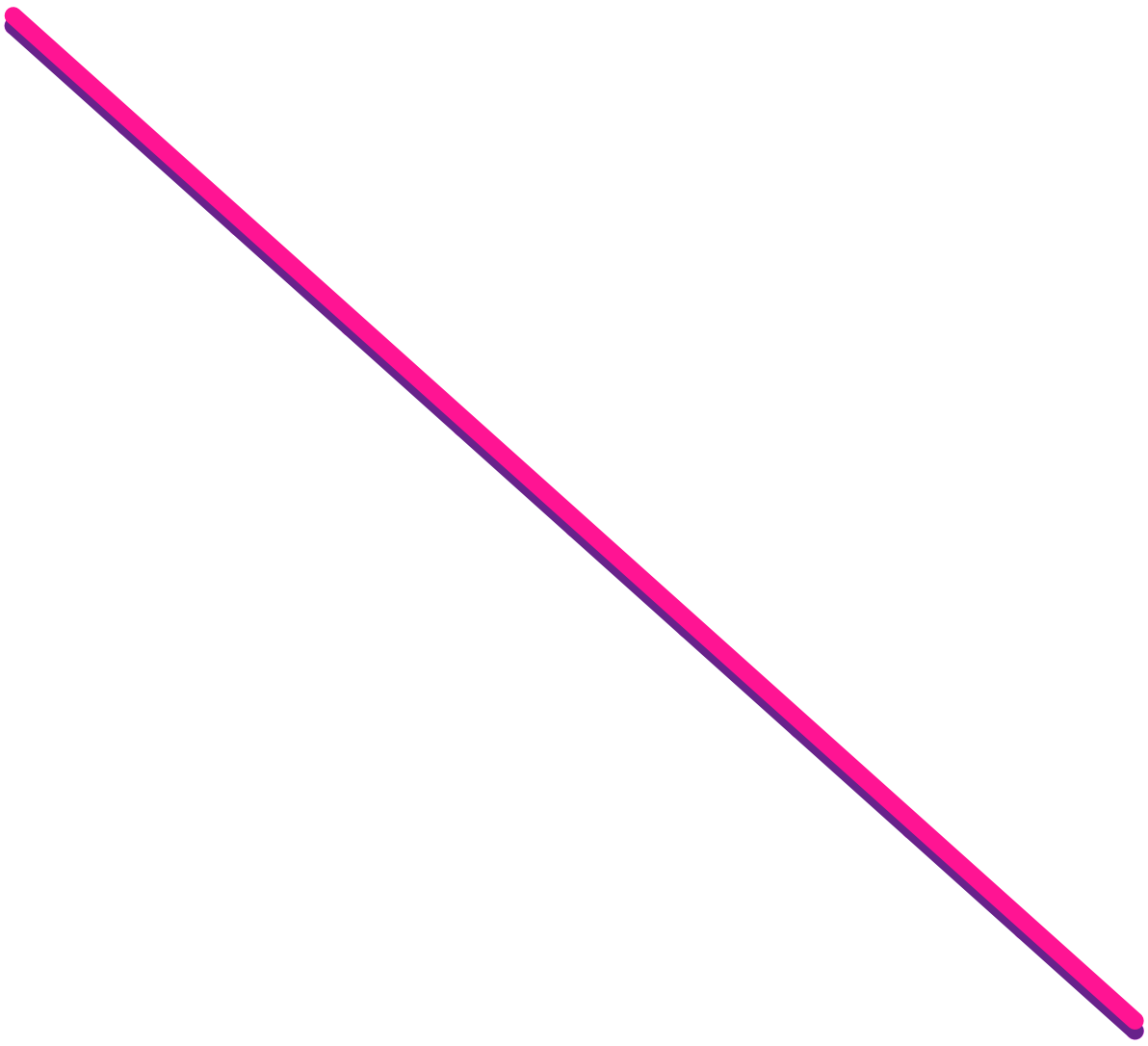
# Independent & Consistent



# Inconsistent & Independent



# Dependent & Consistent



A solution to a System of Linear inequalities is a set of points that satisfy all linear inequalities in the System.

# Examples

Consider the following system of linear inequalities

$$\clubsuit = \begin{cases} y > 2x \end{cases}$$

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Is the point $(-4, 0)$ a solution of the system $\clubsuit$?

# Substitute the Point $(-4, 0)$ to Check

$$y > 2x$$

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$$y > 2x$$

$$0 \overset{?}{>} 2(-4)$$

## Substitute the Point $(-4, 0)$ to Check

$$y > 2x$$

$$0 \stackrel{?}{>} 2(-4)$$

$$0 \stackrel{?}{>} -8$$

Yes!

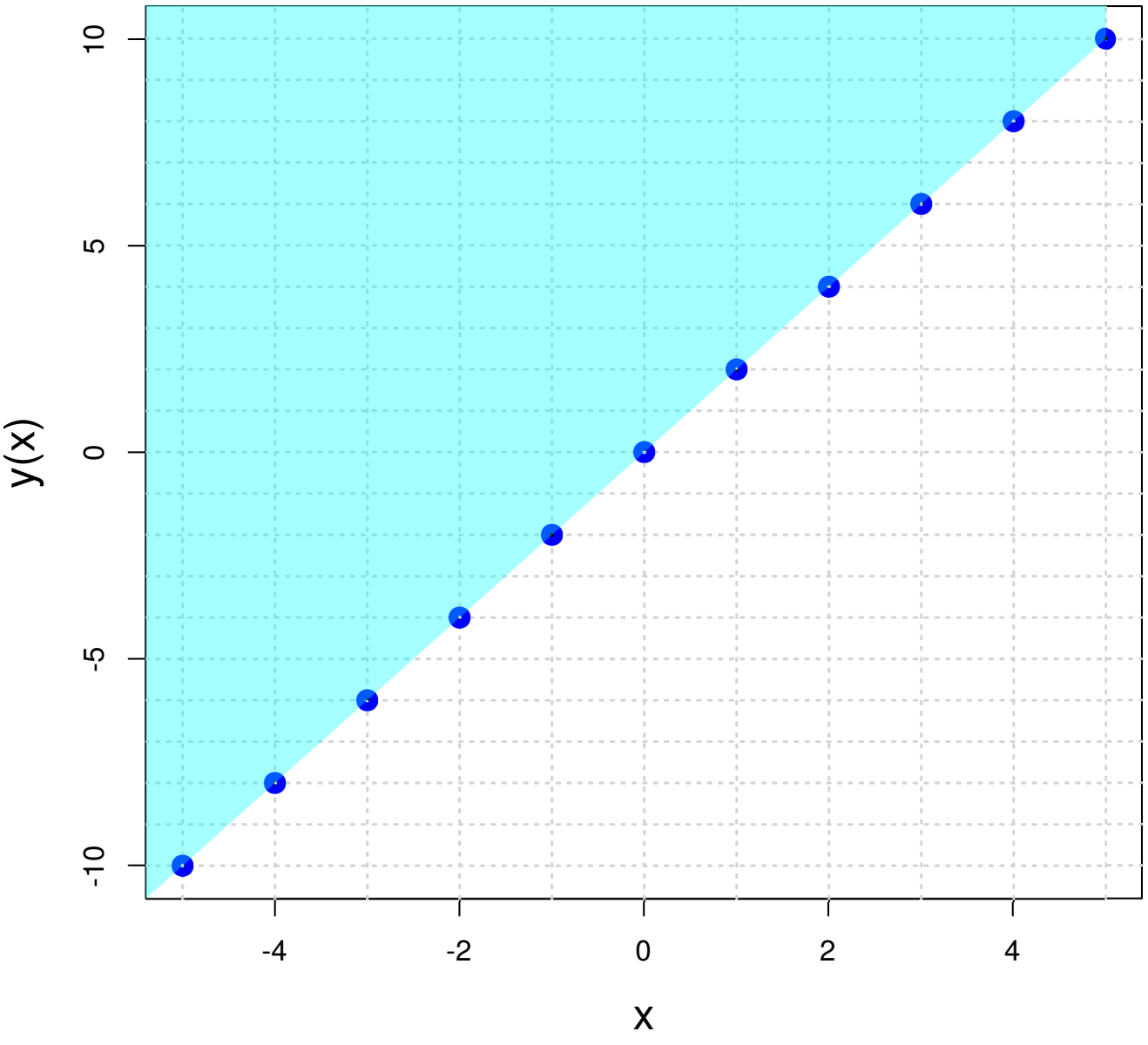
The point $(-4, 0)$ is a solution to the system $\clubsuit$ because it satisfies the system of linear inequalities.

$$\clubsuit = \begin{cases} y > 2x \end{cases}$$

Graph the solutions for

$$\clubsuit = \begin{cases} y > 2x \end{cases}$$

# y > 2x



Consider the following linear system

$$\heartsuit = \begin{cases} y \leq 2x - 1 \end{cases}$$

Consider the following linear system

$$\heartsuit = \begin{cases} y \leq 2x - 1 \end{cases}$$

Is the point $(-2, 4)$ a solution to the system $\heartsuit$?

## Substitute the Point $(-2, 4)$ to Check

$$y \leq 2x - 1$$

# Substitute the Point $(-2, 4)$ to Check

$$y \leq 2x - 1$$

$$4 \stackrel{?}{\leq} 2(-2) - 1$$

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$$4 \stackrel{?}{\leq} 2(-2) - 1$$

$$4 \stackrel{?}{\leq} -4 - 1$$

$$4 \stackrel{?}{\leq} -5$$

## Substitute the Point $(-2, 4)$ to Check

$$y \leq 2x - 1$$

$$4 \stackrel{?}{\leq} 2(-2) - 1$$

$$4 \stackrel{?}{\leq} -4 - 1$$

$$4 \stackrel{?}{\leq} -5$$

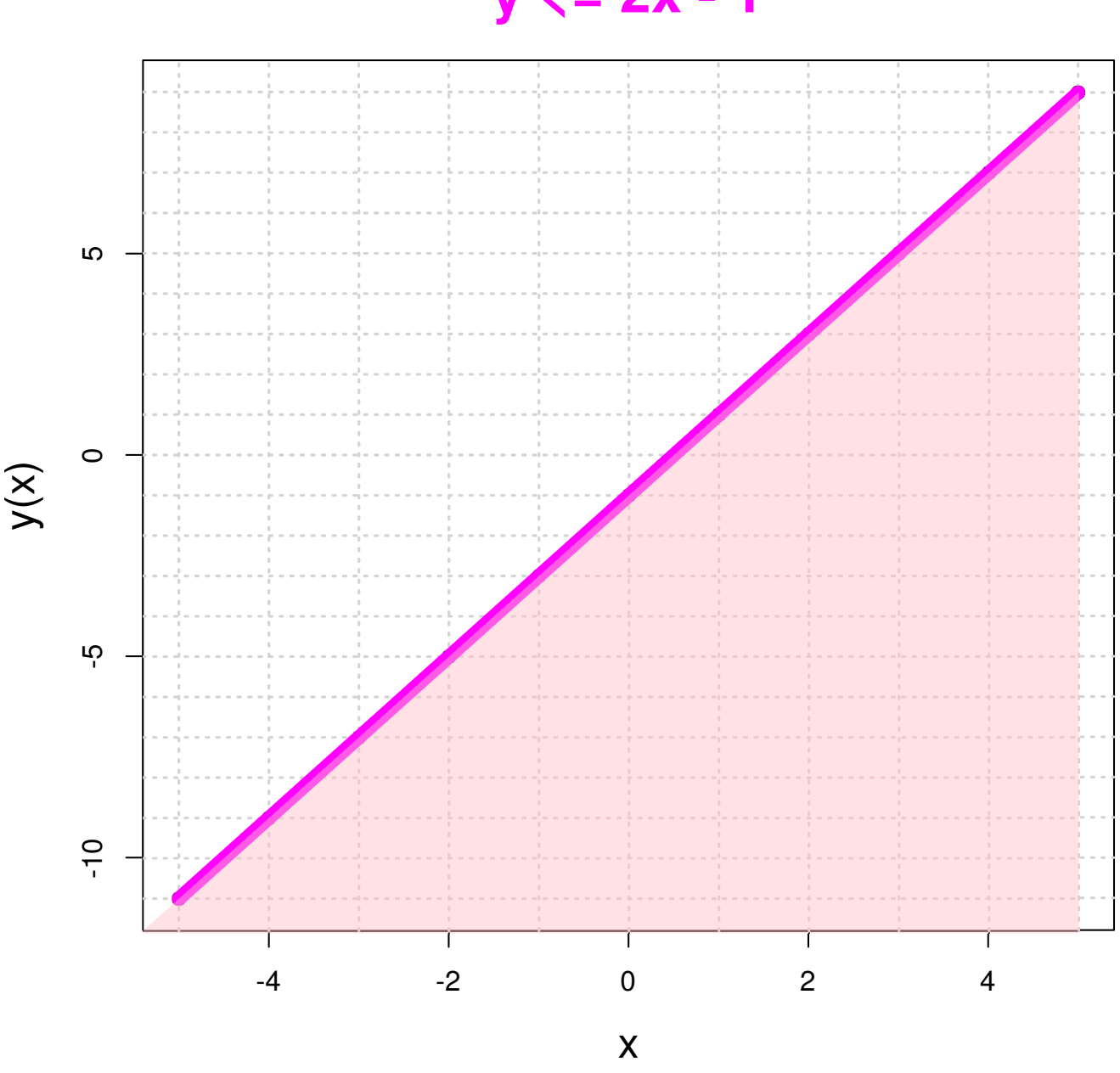
No!

The point $(-2, 4)$ is **not** a solution to the system $\heartsuit$ because it fails to satisfy the system of linear inequalities.

$$\heartsuit = \begin{cases} y \leq 2x - 1 \end{cases}$$

Graph the solutions for

$$\heartsuit = \begin{cases} y \leq 2x - 1 \end{cases}$$

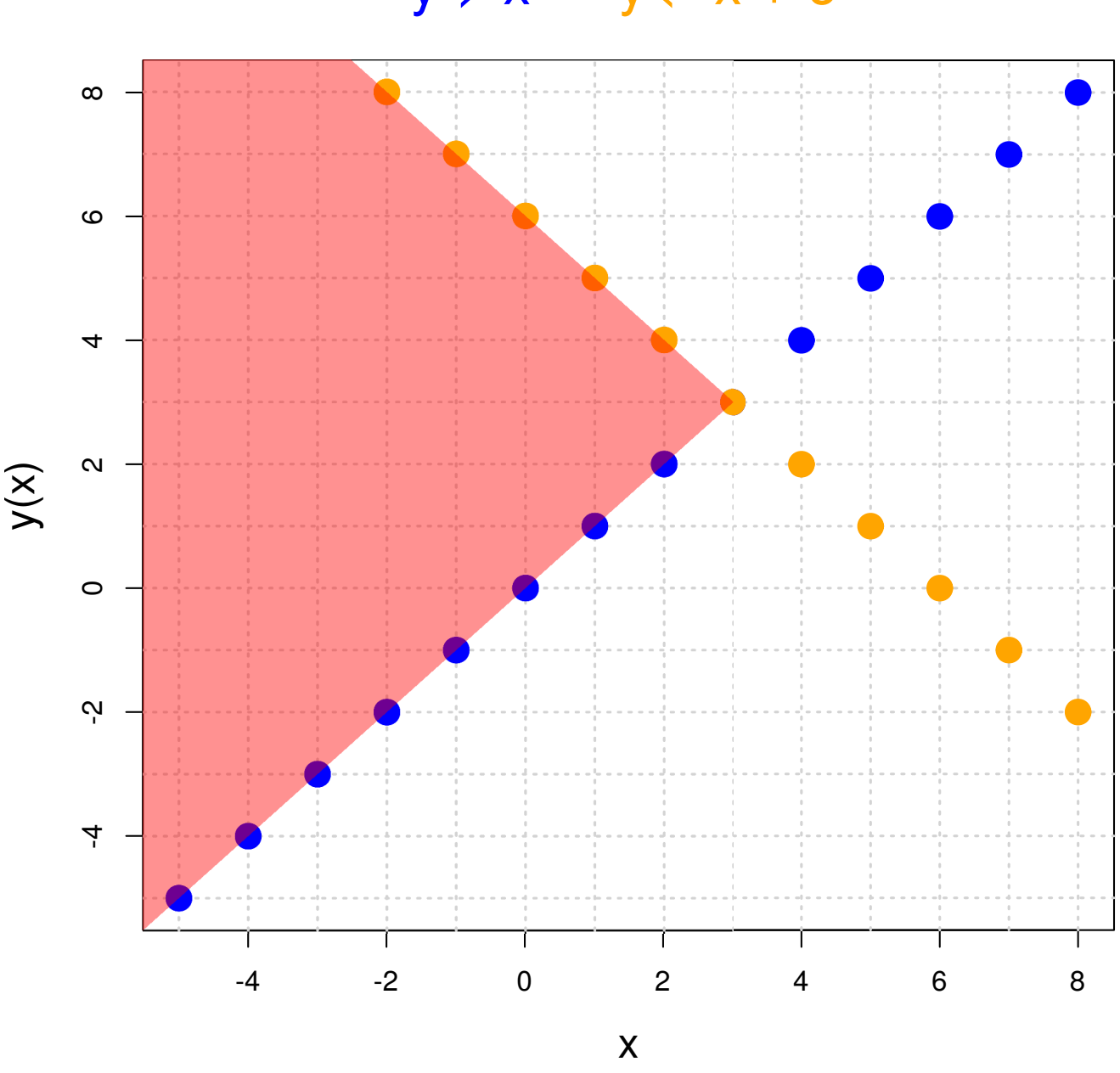

y <= 2x - 1
y(x)
5
0
-5
-10
-4
-2
0
2
4
x

Graph the solutions for the system

$$\diamond = \begin{cases} y \geq -5 \\ x \geq 1 \end{cases}$$

Graph the solutions for the system

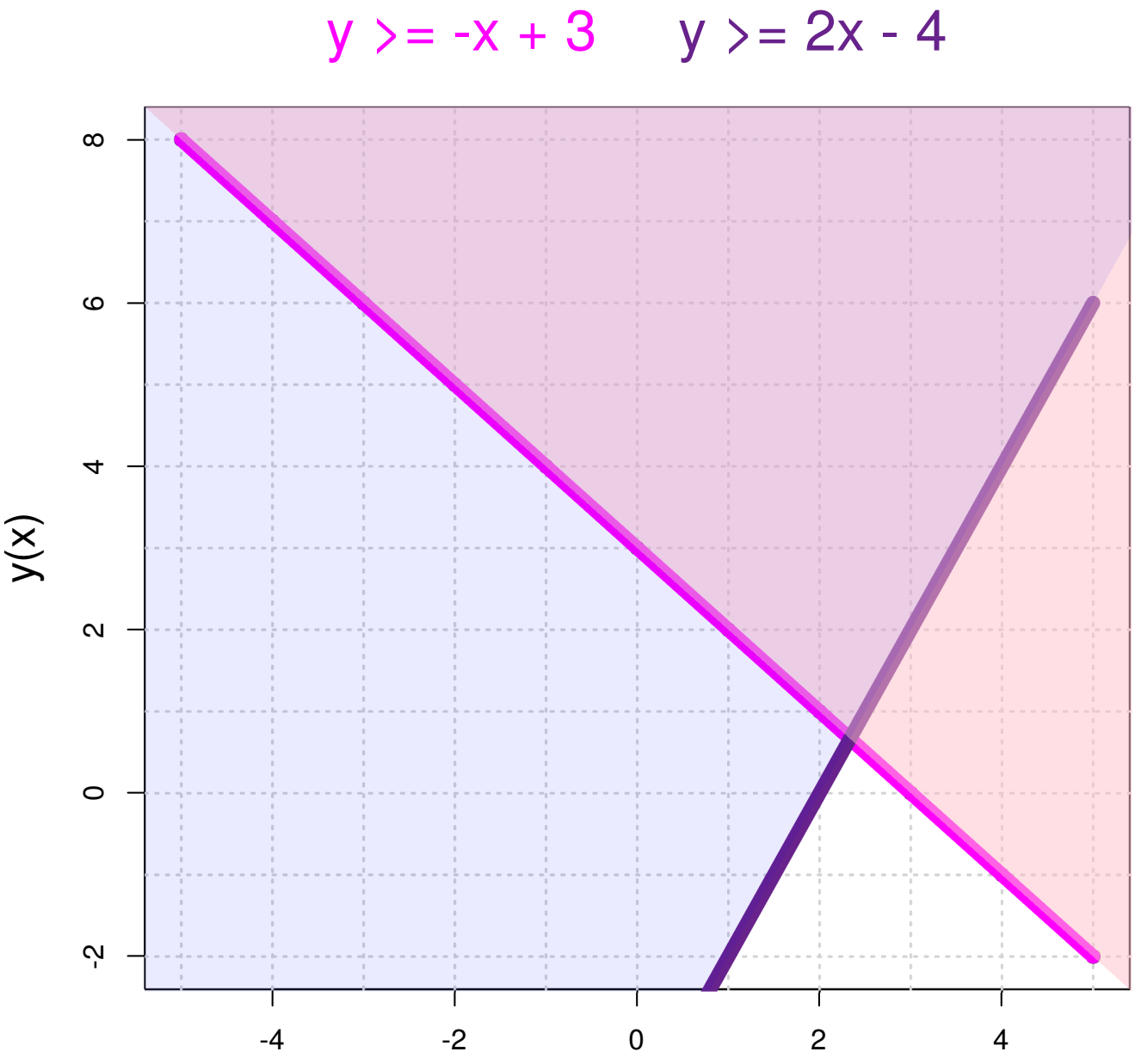
$$\spadesuit = \begin{cases} y > x \\ y < -x + 6 \end{cases}$$


y > x
y< -x + 6
y(x)
x
-4
-2
0
2
4
6
8

Graph the solutions for the system

$$\heartsuit = \begin{cases} 3x + 3y \geq 9 \\ 4x - 2y \leq 8 \end{cases}$$

# Solution is Purple Region



## Next Time

More with Linear Equations and

Linear Inequalities

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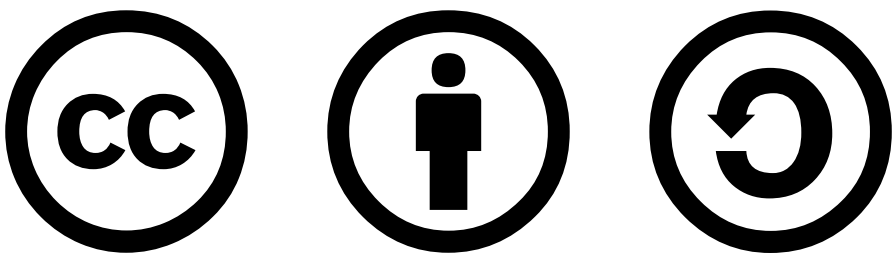
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