

## Solving Systems of Equations by Substitution

The solution to a system of equations represents the **point** where the lines **intersect**.

Steps for Substitution:

- 1) Choose one equation, get  $x$  or  $y$  alone  
(Make one equation  $y =$  or  $x =$ )
- 2) Substitute ( $x =$  or  $y =$  equation) this variable with the new expression in the **other** equation.  
USE PARENTHESES!
- 3) Solve the equation
- 4) Substitute your solution back in the first equation to solve for  $x$  or  $y$ .
- 5) Always express your answer as an ordered pair  $(x, y)$ .

### Example 1:

$$y = -x + 15$$

$$4x + 3y = 38$$

$$4x + 3(-x + 15) = 38$$

$$\underline{4x} - \underline{3x} + 45 = 38$$

$$x + \cancel{45} = 38$$
$$\quad \quad \quad -45 \quad -45$$

$$\boxed{x = -7}$$

$$4(-7) + 3y = 38$$

$$\cancel{-28} + 3y = 38$$
$$\quad \quad \quad +28$$

$$\frac{3y}{3} = \frac{66}{3}$$

$$\boxed{y = 22}$$

$$(-7, 22)$$

### Example 2:

$$2x - 3y = 4$$
$$\quad \quad \quad +3y \quad +3y$$

$$\frac{2x}{2} = \frac{3y}{2} + \frac{4}{2}$$

$$x = \frac{3}{2}y + 2$$

$$x + 4y = -9$$

$$\left(\frac{3}{2}y + 2\right) + 4y = -9$$

$$\frac{11}{2}y + \cancel{2} = -9$$
$$\quad \quad \quad -2 \quad -2$$

$$\frac{11}{2}y = -11$$
$$\quad \quad \quad \frac{11}{2}$$

$$\boxed{y = -2}$$

$$x + 4(-2) = -9$$

$$x - \cancel{8} = -9$$
$$\quad \quad \quad +8 \quad +8$$

$$\boxed{x = -1}$$

$$(-1, -2)$$