Lesson Notes 6-3 **Solving by Substitution Part I**

Recall, the solution to a linear system is an ordered pair and must satisfy both equations in the system. To use the substitution method we must isolate one variable in one equation and substitute it into the other equation.

1. Rearrange each equation to isolate for y:
   a) $5x + y = 22$ $y = 22 - 5x$
   (b) $2y - 4x + 12 = 0$ $\frac{2y}{2} = \frac{4x}{2} - \frac{12}{2}$ $y = 2x - 6$
2. Substitute d = 12 into each equation, then solve for x.
   a) $d + x = 20$ $12 + x = 20$, $-12 \quad -12$, $x = 8$
   (b) $3d - 2x = 22$ $3(12) - 2x = 22$, $36 - 2x = 22$, $-36 \quad -36$, $\frac{-2x}{-2} = \frac{-14}{-2}$, $x = 7$

Example: Solve the following linear system using the substitution method:

$x + y = 9$
$2x + y = 11$

Steps

1. Isolate for a variable in one equation. (Does not matter which equation or variable) $y = -x + 9$, $2x + y = 11$
2. Substitute this new equation into the other equation not used yet. $2x + (-x + 9) = 11$
3. Solve for the variable. $x + 9 = 11$, $x = 2$
4. Find the value of the other variable. $2 + y = 9$, $y = 7$

Examples:

1. $x - y = 7$ $x = y + 7$
   $2x + y = -10$
   $2(y + 7) + y = -10$
   $2y + 14 + y = -10$
   $3y + 14 = -10$, $-14 \quad -14$, $\frac{3y}{3} = \frac{-24}{3}$, $y = -8$
   $x - (-8) = 7$, $x + 8 = 7$, $x = -1$

2. $2x + y = 2$ $y = -2x + 2$
   $3x - 2y = 10$
   $3x - 2(-2x + 2) = 10$
   $3x + 4x - 4 = 10$
   $7x - 4 = 10$, $+4 \quad +4$, $\frac{7x}{7} = \frac{14}{7}$, $x = 2$
   $2(2) + y = 2$
   $4 + y = 2$
   $y = -2$