~~Algebra 1~~ F, Math 3 Name: _____

Notes ~~2.8~~ 2.2

Solving Systems of Equations by Substitution

linear

The three possibilities for solutions of a system of equations is one solution, infinite sol., or no sol.

If there is one solution, the answer will be a point (x, y).

Solving Systems of Equations by Substitution

One method to solve a system of equations is called substitution. To solve using substitution, we can use the following steps:

1. Solve one equation for x or y (whichever is easier). Solve for a variable
2. Substitute the solved equation into the other equation.
3. Solve the equation.
4. Substitute in the solution from step 3 into either equation and solve for remaining variable.

Ex 1) Solve the equation by substitution:

$y = 4x - 8$
$y = -x + 7$

$y = 4(3) - 8$
$y = 12 - 8 = 4$

$4x - 8 = -x + 7$
$4x + x = 8 + 7$
$5x = 15$
$x = 3$

$y = -3 + 7$
$y = 4$

Solution: (3, 4)

Ex 2) Solve the equation by substitution:

$3y + 2x = -1$
$-6x + y = -7$

$y = 6x - 7$

$3y + 2x = -1$
$3(6x - 7) + 2x = -1$
$18x - 21 + 2x = -1$
$20x - 21 = -1$
$\frac{20x}{20} = \frac{20}{20}$
$x = 1$

$y = 6(1) - 7$
$y = 6 - 7 = -1$

Solution: (1, -1)

Check:
$3(1) + 2(-1) = -1$
$-3 + 2 = -1$ ✓

Ex 3) $3x - y = 6$
$x + 2y = 2$

$x = -2y + 2$

$3(-2y + 2) - y = 6$
$-6y + 6 - y = 6$
$-7y + 6 = 6$
$-6 \quad -6$
$-7y = 0$
$\frac{-7y}{-7} = \frac{0}{-7}$
$y = 0$

$x = -2(0) + 2$
$x = 2$

Solution: (2, 0)

Ex 4) $2x + 3y = 6$
$5x + 6y = 6$

$2x + 3y = 6$
$\frac{3y}{3} = -\frac{2x}{3} + \frac{6}{3}$
$y = -\frac{2}{3}x + 2$

$y = -\frac{2}{3}(-6) + 2$
$y = 4 + 2$
$y = 6$

Solution: (-6, 6)

$5x + 6(-\frac{2}{3}x + 2) = 6$
$5x - 4x + 12 = 6$
$x + 12 = 6$
$x = -6$