

Name \_\_\_\_\_  
Date \_\_\_\_\_

MTH 098-184  
Class #15

**Linear Equations – Systems – Solution by Substitution**

Quality – Accuracy – Transfer – 100%

**Section 1. Some Arithmetic**

1. Resolve the linear equation:  $5x + 4y = 15$  for  $x = \frac{23}{16}$  and  $y = \frac{125}{64}$

NOTES:  $5\left(\frac{23}{16}\right) + 4\left(\frac{125}{64}\right) = 15$   $15 = 15 \checkmark$

$$\frac{115}{16} + \frac{125}{16} = 15$$

$$\text{look} \Rightarrow \frac{240}{16} = 15$$

2. Resolve the linear equation:  $3x + 5y = 11$  for  $x = \frac{4}{5}$  and  $y = \frac{43}{25}$

NOTES:  $3\left(\frac{4}{5}\right) + 5\left(\frac{43}{25}\right) = 11$

$$\frac{12}{5} + \frac{43}{5} = 11$$

$$\frac{55}{5} = 11$$

$$11 = 11 \checkmark$$

**Section 2. Preparing to Solve Linear Systems by the “Substitution Technique”**

1. Our second technique for solving systems of linear equations algebraically is to use Substitution

- a. Consider the linear system:  $4x + 3y = 27$   
 $y = 2x + 1$

- b. Decide which Equation is the “DEFINITION” of one variable in terms of another.

\*\*Look for  $y = 2x + 1$  or  $x =$  \_\_\_\_\_

- c. Replace the DEFINITION equation into the other equation. Distribute, and combine like terms. Find the second variable in the definition equation and check into the second equation.

- d. Solve the System of Equations:  $4x + 3y = 27$   
 $y = (2x + 1)$

$$4x + 3(2x + 1) = 27$$

$$4x + 6x + 3 = 27$$

$$10x + 3 = 27$$

$$\frac{10x}{10} = \frac{24}{10}$$

$$x = 2.4$$

$$y = 2(2.4) + 1$$

$$y = 4.8 + 1$$

$$y = 5.8$$

$$4(2.4) + 3(5.8) = 27$$

$$9.6 + 17.4 = 27$$

$$27 = 27 \checkmark$$

2. More Fun with Substitution

a. Consider the linear system:

$$\begin{array}{l} 4x + 3y = 26 \\ x + 2y = 2 \end{array}$$

b. Decide which Equation contains the "SINGLETON". Re-Arrange that Equation for the DEFINITION.

\*\*Look for and single  $y =$  \_\_\_\_\_ or a single  $x = 2 - 2y$

c. Replace the DEFINITION equation into the other equation. Distribute, and combine like terms. Find the second variable in the definition equation and check into the second equation.

d. Solve the System of Equations:

$$\begin{array}{l} 4x + 3y = 26 \\ x + 2y = 2 \end{array}$$

$$\begin{array}{l} 4(2-2y) + 3y = 26 \\ 8 - 8y + 3y = 26 \\ 8 - 5y = 26 \\ -8 \quad -8 \\ -5y = 18 \\ \boxed{y = -3.6} \end{array}$$

$$\begin{array}{l} x = 2 - 2(-3.6) \\ x = 2 + 7.2 \\ \boxed{x = 9.2} \\ 4(\underline{9.2}) + 3(-3.6) = 26 \\ 36.8 - 10.8 = 26 \\ 26 = 26 \checkmark \end{array}$$

Section 3. Practice: Solve and Check the Following:

1.  $r = (-3s)$   
 $3r + 4s = -10$   
 $3(-3s) + 4s = -10$   
 $-9s + 4s = -10$   
 $-5s = -10$   
 $\frac{-5s}{-5} = \frac{-10}{-5}$   
 $\boxed{s = +2}$

2.  $x = y - 2$   
 $x + y = 18$   
 $r = -3(2)$   
 $\boxed{r = -6}$   
 $3(2) + 4(-6) = -10$   
 $3(-6) + 4(2) = -10$   
 $-18 + 8 = -10$   
 $-10 = -10 \checkmark$

3.  $y = 3x - 1$   
 $7x + 2y = 37$

4.  $3x - y = 1$   
 $x + 2y = 12$

$x = (12 - 2y)$

$3(12 - 2y) - y = 1$       $x = 12 - 2(5)$

$36 - 6y - y = 1$       $x = 12 - 10$

$36 - 7y = 1$       $x = 2$

$-36$       $-36$

$-7y = -35$

$y = +5$

$3(2) - (5) = 1$

$6 - 5 = 1$

$1 = 1 \checkmark$

5.  $2x = 3y$       $\frac{2x}{2} = \frac{3y}{2}$   
 $4x - 3y = 12$       $x = (\frac{3}{2}y)$

$\frac{2}{4}(\frac{3}{2}y) = 3y = 12$       $x = \frac{3}{2}(4)$

$6y - 3y = 12$

$x = 6$

$3y = 12$   
 $y = 4$

$4(6) - 3(4) = 12$

$24 - 12 = 12$

$12 = 12 \checkmark$

6.  $x + y = 500$   
 $y = (1.5x)$

$y = 1.5(200)$

$x + (1.5x) = 500$

$y = 300$

$2.5x = 500$

$x = 200$

$200 + 300 = 500$

$500 = 500 \checkmark$

Homework Section

Section(s)	Page(s)	Problem(s)
9.2	566 → 567	5 → 29 E.O.O.*

\*E.O.O. Means "Every Other Odd"