

Lesson 3 – Sec. 7.4 Solving Systems by Substitution

Use **substitution** when one of the equations has a coefficient (the number in front of the variable) that is ± 1 .

Example 1: Solve this linear system:

$$\textcircled{1} \quad 3x + 4y = -4$$

$$\textcircled{2} \quad x + 2y = 2$$

Step 1: Isolate the "1" coefficient variable.

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

$$\underline{x = -2y + 2}$$

Step 2: Plus isolated value into the other equation and solve.

$$3x + 4y = -4$$

$$3(-2y + 2) + 4y = -4$$

$$\underline{-6y} + 6 + 4y = -4$$

$$\underline{-2y} + 6 = -4 \quad \underline{-6} \quad \underline{-6}$$

$$\underline{-2y} = \underline{-10} \quad y = 5$$

Step 3: Substitute value from step 2 into isolated equation.

$$x = -2y + 2$$

$$x = -2(5) + 2$$

$$x = -10 + 2$$

$$x = -8$$

Step 4: Check $P(-8, 5)$

$$3x + 4y = -4$$

$$3(-8) + 4(5) = -4$$

$$-24 + 20 = -4$$

$$-4 = -4 \quad \checkmark$$

Example 2: Solve this linear system:

① $2x - 4y = 7$

② $4x + y = 5$

$y = -4x + 5$

$2x - 4(-4x + 5) = 7$

$2x + 16x - 20 = 7$

$18x - 20 = 7$
 $\quad + 20 \quad + 20$

$18x = 27$ $x = \frac{27}{18} = \frac{3}{2}$

$y = -4x + 5$

$y = -4\left(\frac{3}{2}\right) + 5$

$y = -6 + 5 = -1$

check: $2\left(\frac{3}{2}\right) - 4(-1) = 7$

$3 + 4 = 7$

$7 = 7 \checkmark$

$P\left(\frac{3}{2}, -1\right)$

Example 3: Solve this linear system:

① $4x + y = 6$

② $2y - 3x = 1$

$\rightarrow y = -4x + 6$

$2(-4x + 6) - 3x = 1$

$-8x + 12 - 3x = 1$

$-11x + 12 = 1$

$\quad -12 \quad -12$

$\frac{-11x}{-11} = \frac{-11}{-11} \quad x = 1$

$y = -4(1) + 6$

$y = -4 + 6 = 2$

check: $2(2) - 3(1) = 1$

$4 - 3 = 1$

$1 = 1 \checkmark$

$P(1, 2)$

Example 4: Create a linear system to model this situation:

Ned invested \$2000, part at an annual interest rate of 8% and the rest at 10%. After one year, the total interest was \$190. How much did he invest at each rate?

Let $x = 8\% = 0.08$

$x + y = 2000$

$x = -y + 2000$

$y = 10\% = 0.10$

$0.08x + 0.1y = 190$

$[0.08x + 0.1y = 190] \times 100$

$8x + 10y = 19000$

$8(-y + 2000) + 10y = 19000$

$-8y + 16000 + 10y = 19000$

$2y + 16000 = 19000$

$\quad -16000 \quad -16000$

$x = -(1500) + 2000$

$x = 500$

page 425 #4abc, 5ac, 11, 15, 16, 23

$\frac{2y}{2} = \frac{3000}{2}$

$y = 1500$ Marsh

Math 10 FP

Ned invested \$500 @ 8% and \$1500 @ 10%.