

Name: Caleb McWhorter — Solutions

MATH 100

Fall 2021

HW 14: Due 12/08

*“One morning I shot an elephant in my pajamas. How he got into my pajamas I’ll never know.”*

*–Groucho Marx*

**Problem 1.** (10pt) Solve the following system of equations using substitution:

$$y = 2x - 3$$

$$3x - y = 4$$

**Solution.** The first equation is already expressed in terms of  $y$ . Using this expression for  $y$  in the second equation, we have...

$$3x - y = 4$$

$$3x - (2x - 3) = 4$$

$$3x - 2x + 3 = 4$$

$$x + 3 = 4$$

$$x = 1$$

But then we know that  $y = 2(1) - 3 = 2 - 3 = -1$ . Therefore, the solution is  $(1, -1)$ .

**Problem 2.** (10pt) Solve the following system of equations using substitution:

$$2x - 3y = -12$$

$$3x + 5y = 1$$

**Solution.** We solve for  $y$  in the first equation:

$$2x - 3y = -12$$

$$-3y = -2x - 12$$

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

Using this expression in the second equation, we have...

$$3x + 5y = 1$$

$$3x + 5\left(\frac{2}{3}x + 4\right) = 1$$

$$3x + \frac{10}{3}x + 20 = 1$$

$$3\left(3x + \frac{10}{3}x + 20\right) = 1 \cdot 3$$

$$9x + 10x + 60 = 3$$

$$19x + 60 = 3$$

$$19x = -57$$

$$x = -3$$

But then  $y = \frac{2}{3} \cdot -3 + 4 = -2 + 4 = 2$ . Therefore, the solution is  $(-3, 2)$ .

**Problem 3.** (10pt) Solving the following system of equations using elimination:

$$\begin{aligned}x - 3y &= 5 \\ -x + 5y &= 7\end{aligned}$$

**Solution.** We add the equations to immediately eliminate the  $x$ -term:

$$\begin{array}{r}x - 3y = 5 \\ -x + 5y = 7 \\ \hline 2y = 12 \\ y = 6\end{array}$$

But then we know that...

$$\begin{aligned}x - 3y &= 5 \\ x - 3(6) &= 5 \\ x - 18 &= 5 \\ x &= 23\end{aligned}$$

Therefore, the solution is  $(23, 6)$ .

**Problem 4.** (10pt) Solving the following system of equations using elimination:

$$2x - 3y = 17$$

$$3x + 2y = 6$$

**Solution.** We eliminate the  $y$  terms. Multiplying the first equation by 2 and the second equation by 3, we have...

$$4x - 6y = 34$$

$$9x + 6y = 18$$

Then we add these equations to find...

$$4x - 6y = 34$$

$$9x + 6y = 18$$

$$\hline 13x = 52$$

$$x = 4$$

But then we have...

$$4x - 6y = 34$$

$$4(4) - 6y = 34$$

$$16 - 6y = 34$$

$$-6y = 18$$

$$y = -3$$

Therefore, the solution is  $(4, -3)$ .