MAT 099 Homework Chapter 4

Due February 27th Name KEY

On the elimination problems, I just want you to eliminate the x in the 2nd equation. In the 3x3 cases (See #s 7 – 9), after you've eliminated x in the 2nd and 3rd equations, I want you to eliminate y in the 3rd equation. Do work on separate paper. Then show steps on this sheet.

1. **4.1** Solve the system of equations by the substitution method:
$$\begin{aligned} 6x - y &= -5 \\ 4x - 2y &= 6 \end{aligned}$$

$-y = -6x - 5$

$y = 6x + 5$

$4x - 2(6x+5) = 6$

$4x - 12x - 10 = 6$

$-8x - 10 = 6$

$-8x = 16 \Rightarrow x = -2$

$x = -2$

$y = 6x + 5$ $\Rightarrow y = 6(-2) + 5$

$= -12 + 5$

$= -7$

$(x, y) = (-2, -7)$

$(x, y) \in \{(-2, -7)\}$

2. **4.1** Solve the system of equations by the elimination method:
$$\begin{aligned} 3x + 4y &= 2 \\ 2x + 5y &= -1 \end{aligned}$$

$-2R1$ $-6x - 8y = -4$

$3R2$ $6x + 15y = -3$

$-2R1 + 3R2$ $7y = -7$

$y = -1$

$3x + 4y = 2$

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

$3x - 4 = 2$

$3x = 6$

$x = 2$

$(x, y) = (2, -1)$ OR $(x, y) \in \{(2, -1)\}$

3. **4.1** Re-write the systems without fractions or decimals. Do not *solve* the systems:

a. $\left(\frac{1}{2}x - \frac{1}{3}y = -3\right)6$: $3x - 2y = -18$

$\left(\frac{1}{8}x + \frac{1}{6}y = 3\right)(24)$: $3x + 4y = 72$

b. $\begin{aligned} 2.3x + 7.2y &= 11.8 \\ -1.2x + 2.7y &= 13 \end{aligned}$

$23x + 72y = 118$

$-12x + 27y = 130$

4. **4.2** Cashews are worth \$2.00 per pound. Peanuts cost \$1.50 per pound. How many pounds of each should be mixed together to obtain 50 pounds of a mixture worth \$1.80 per pound.

Let x = # of lbs of cashews
and y = " " " " peanuts.

Then $x + y = 50$ TOTAL WT
and $2x + 1.5y = (1.80)(50)$ TOTAL COST

$y = 50 - x$;
$2x + 1.5(50 - x) = 90$
$2x + 75 - 1.5x = 90$
$0.5x + 75 = 90$
$.5x = 15$
$x = \frac{15}{.5} = 30 = x$ → $y = 20$

5. **4.3** How much 37% and 42% alcohol solution should be used to make 100 milliliters of 40% alcohol?

Let x = volume of 37% mix used (ml)
and y = " " 42% " " (")

Then $x + y = 100$
and $.37x + .42y = .4(100)$

$\Rightarrow y = 100 - x$;

$.37x + .42(100 - x) = 40$
$37x + 42(100 - x) = 4000$
$37x + 4200 - 42x = 4000$
$-5x + 4200 = 4000$
$-5x = -200$
$x = \frac{-200}{-5} = 40 = x$ → $y = 60$

6. **4.3** Set up the word problem. Do not solve.

Carlotta has \$10,000 to invest. I recommend that the invest in Treasury bills that yield 6%, Treasury bonds the yield 7%, and corporate bonds that yield 8%. Carlotta wants to have an annual income of \$680 and the amount invested in corporate bonds must be half that invested in Treasury bills. What is the amount of each investment?

Let x = Amt invested in T-Bills (\$),
y = " " " T-Bonds ", and
z = " " " C-Bonds "

Then $x + y + z = 10000$,
$.06x + .07y + .08z = 680$,
$z = \frac{1}{2}x$
and

4.2 Solve the following systems of linear equations, if possible. If not possible, state why. One of them will have infinitely many solutions. One will have no solutions. The format I want you to use is as follows:

a. Separate sheet of paper for each problem.
b. Write on only one side of each page. If you need more than one side, you're doing it wrong, but use an entire sheet for each problem.
c. Paper without lines on it is *required.*
d. Do all your work on separate paper. When you've arrived at a solution, write it up, showing steps, very neatly on the paper you will turn in.

2, 19, 3, 54

7. $4x - y + 3z = 10$, $x + y - z = 5$, $8x - 2y + 6z = 10$

8. $x - y + 2z = 3$, $4x + y - z = 8$, $3x - y + z = 6$

9. $x - 2y - 4z = -19$, $2x - 3y - 7z = -27$, $-3x + 4y + 10z = 35$

$$\left[\begin{array}{ccc|c} 1 & 1 & -1 & 5 \\ 4 & -1 & 3 & 10 \\ 8 & -2 & 6 & 10 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & 1 & -1 & 5 \\ 0 & -5 & 7 & -10 \\ 0 & -10 & 14 & -30 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & 1 & -1 & 5 \\ 0 & -5 & 7 & -10 \\ 0 & 0 & 0 & -10 \end{array}\right]$$

$z = -10$!?

No Soln!

$\emptyset$

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 3 \\ 4 & 1 & -1 & 8 \\ 3 & -1 & 1 & 6 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 3 \\ 0 & 5 & -9 & -4 \\ 0 & 2 & -5 & -3 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 3 \\ 0 & 5 & -9 & -4 \\ 0 & 0 & -7 & -7 \end{array}\right]$$

$-2R2+5R3$

$-7z = -7$

$z = 1$

$5y - 9(1) = -4$

$5x = 5$

$y = 1$

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

$x = 2$

$(x, y, z) = (2, 1, 1)$

$\{(2, 1, 1)\}$

$$\left[\begin{array}{ccc|c} 1 & -2 & -4 & -19 \\ 2 & -3 & -7 & -27 \\ -3 & 4 & 10 & 35 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -2 & -4 & -19 \\ 0 & 1 & 1 & 11 \\ 0 & -2 & -2 & -22 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -2 & -4 & -19 \\ 0 & 1 & 1 & 11 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

$y + z = 11$

$y = -z + 11$

$x - 2y - 4z = -19$

$x - 2(-z + 11) - 4z = -19$

$x + 2z - 22 - 4z = -19$

$x - 2z - 22 = -19$

$x = 2z + 3$

$z = ANY$

$\{(2z + 3, -z + 11, z) \mid z \in \mathbb{R}\}$