
Homework 6 (General Systems of Linear Equations)

MA 103, Instructor: Jeffrey Horn, Winter 2017 NAME:

Instructions

Read section Section 2.2 of Chapter 2 of our textbook. Answer the questions below. Show work for partial credit but be sure to indicate clearly your final answer! (e.g., put a box around it) Attach extra sheets of paper if you need more space. Note that if the question asks you to “find all solutions” then you should indicate clearly if there is a unique solution (and you should give it!), there is NO solution, or there are infinitely many solutions (in which case you should give a specification of the set of solutions, e.g., $x + y = -18$).

Question 1.

Find all solutions:

$$\begin{aligned}5x + 6y &= 7 \\3x + 9y &= 10\end{aligned}$$

Question 2.

Find all solutions:

$$\begin{aligned}6x + 18y &= 20 \\3x + 9y &= 10\end{aligned}$$

Question 3.

Find all solutions:

$$\begin{aligned}-2x + 6y &= 22 \\6x - 18y &= -30\end{aligned}$$

Question 4.

Find all solutions:

$$\begin{aligned}x - y + z &= 2 \\-x + y - z &= 1 \\x + y + z &= 4\end{aligned}$$

Question 5.

Find all solutions:

$$\begin{aligned}x - y + z &= -2 \\x + y + z &= -1 \\x - y - z &= 8\end{aligned}$$

Question 6.

Find all solutions:

$$\begin{aligned}x - y + z &= -2 \\3x - 3y - z &= 14 \\x - y - z &= 8\end{aligned}$$

Question 7.

Let's go back to problem 68 on page 60 of our text, which is in section 2.1. The problem is titled *Investment Planning*. We worked out a unique solution to this problem in class. Now let's modify the problem so that instead of having \$5000 to invest, Jim and Lucy have just \$4000. (All other problem parameters remain the same.) Is there a unique solution now? (I.e., can they invest \$4000 split among the three investment plans A,B, and C (paying 1%, 3.6%, and 5.5% annual interest, respectively) such that the amount in C is equal to the amounts in A and B combined, and such that they earn a total of \$195 annual interest?) If there is a unique solution, say so and give it. If there are multiple solutions, say so and give ONE. If there are no solutions, say so and find some investment amount that DOES yield a solution but is less than \$5000. (Extra credit if you can find a MINIMAL such investment amount.) Also give a solution to your modified problem.