**Name: Stephen Kim Student ID: 1947806**

# MAT 220—Homework 6

1. **Verify that**

**x = 7t – 8**

**y = 2 – 5t**

**z = t**

**are solutions of**

**2x + 3y + z = -10**

**x + y - 2z = -6**

**for all values of t.**

2x + 3y + z = -10

2x = -10 – 3y – z 🡪 x = -5 – 3/2y – ½z

= -5 – (3/2)(2 – 5t) – (1/2)(t) = -5 – 3 + 15/2t – 1/2t = 7t – 8

3y = -10 – 2x – z 🡪 y = -10/3 – 2/3x – 1/3z

= -10/3 – (2/3)(7t – 8) – (1/3)(t) = -10/3 – 14/3t + 16/3 – 1/3t = -5t + 2 = 2 – 5t

z = -10 – 2x – 3y

= -10 – 2(7t – 8) – 3(2 – 5t) = -10 – 14t + 16 – 6 + 15t = t

2(7t – 8) + 3(2 – 5t) + t = -10

14t – 16 + 6 – 15t + t = -10

0t = 0

Works for all values of t.

x + y - 2z = -6

x = -6 – y + 2z = -6 – (2 – 5t) + 2t = -6 – 2 + 5t + 2t = 7t - 8

y = -6 – x + 2z = -6 – (7t – 8) + 2t = -6 – 7t + 8 + 2t = 2 – 5t

2z = x + y + 6 🡪 z = (7t – 8) + (2 – 5t) + 6 = 2t

(7t – 8) + (2 – 5t) - 2(t) = -6

0t – 6 = -6

0t = 0

0t = 0

Works for all values of t.

1. **Regarding 7z = 9 as the equation 0x + 0y + 7z = 9 in three variables, find all solutions in parametric form.**

0x1 + 0y + 7z = 9

x = s

y = t

7z = 9 – 0s – 0t 🡪 z = 9/7 – 0s – 0t

1. **Write the augmented matrix for the following system of linear equations. (Hint: Pay close attention to the variables.)**

**6x – z = -5**

**-5x – 6y = -2**

**-7y – 3z = 3**

6x + 0y – z = -5

-5x – 6y + 0z = -2

0x – 7y – 3z = 3

1. **Write a system of linear equations that has the following augmented matrix.**

5x + 2y + 0 = 3

3x + 2y – 4z = 9

-2x – y + 4z = 6

1. **Find the quadratic ax2 + bx + c such that the graph of y = ax2 + bx + c contains the points (-1, 11), (1, 5), and (3, 7). Show all work, including a system of equations, augmented matrix, and Gauss-Jordan elimination.**

a(-1)2 + b(-1) + c = 11

a(1)2 + b(1) + c = 5

a(3)2 + b(3) + c = 7

🡪 y = -8x2 – 3x + 16

1. **Determine whether or not the vector x can be written as a linear combination of the vectors u, v, w. If so, give such a linear combination. Show all work, including a system of equations, augmented matrix, and Gauss Jordan elimination.**
   1. **x = (-9, -4, 3), u = (1, -4, -1), v = (-2, 2, -5), w = (-4, 3, -1)**

3u -2v + 4w = x

* 1. **x = (2, 14, 6), u = (2, -12, -6), v = (4, 10, 6), w = (-5, 13, 6)**

🡪 no solution

* 1. **x = (0, -9, 3), u = (-2, -15, 2), v = (4, 3, 5), w = (4, 12, 2)**

u + ½w = x

1. **Determine whether the vectors u, v, w are linearly dependent or linearly independent. Show all work, including a system of homogeneous equations and the augmented matrix. You can reference your Gauss-Jordan elimination in the previous problem to shorten the process. If the vectors are linearly dependent, find all solutions to the system of homogeneous equations.**
   1. **u = (1, -4, -1), v = (-2, 2, -5), w = (-4, 3, -1)**

x = = = + s + t

x1 = when s = 0 = t, x0 = s + t gives all solution to associated homogeneous system

linearly independent

* 1. **u = (2, -12, -6), v = (4, 10, 6), w = (-5, 13, 6)**

x = = = + s + t

x1 = when s = 0 = t, x0 = s + t gives all solution to associated homogeneous system

linearly independent

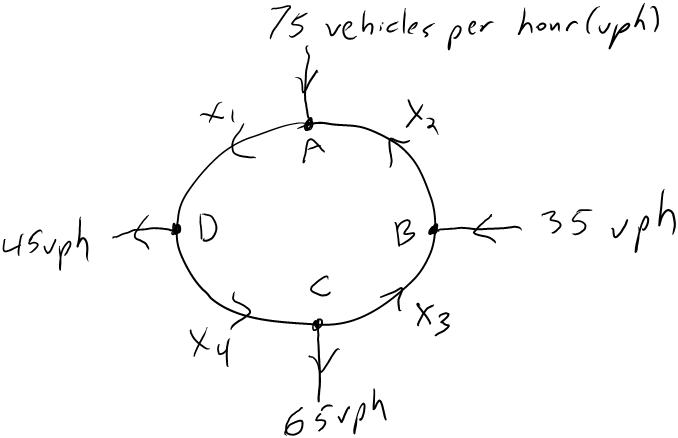
* 1. **u = (-2, -15, 2), v = (4, 3, 5), w = (4, 12, 2)**

x = = = + s + t

x1 = when s = 0 = t, x0 = s + t gives all solution to associated homogeneous system

linearly dependent

1. **Find the possible traffic flows in the roundabout below. Show all work, including a system of equations, augmented matrix, and Gauss-Jordan elimination.**

****

In Out

A: x2 + 75 = x1 🡪 x1 – x2 + 0x3 + 0x4 = 75

B: x3 + 35 = x2 🡪 0x1 + x2 – x3 + 0x4 = 35

C: x4 = x3 + 65 🡪 0x1 + 0x2 – x3 + x4 = 65

D: x1 = x4 + 45 🡪 x1 + 0x2 + 0x3 – x4 = 45

x1 = 110, x2 = -30, x3 = -35, x4 = 30

1. **Use Gauss-Jordan elimination to determine whether the matrices are invertible. If the matrix is invertible, give the inverse. Then use matrix multiplication to check that your answer is correct.**
   1. **A =**

I think that if a matrix has a row of 0’s or a column of 0’s its not invertible. Otherwise I messed up somewhere.

* 1. **A =**

AA-1 =

=

= =

= A-1

1. **Find the LU-factorization for each A in the previous question. (Find L, find U, and verify by multiplying them together.)**

**Can you use the LU-decomposition to solve the equation Ax = ? If so, use the LU-factorization to find the solution x and then plug in x to verify it is correct. If you cannot use the LU-factorization to solve the equation, explain why not.**

I don’t think you can use LU decomposition to solve Ax = because you need square

* 1. **A =**

Row2: -2R1 + R2

Row3: -R1 + R3

Row3: -3/2R2 + R3 = L

= U

A =

=

= =

* 1. **A =**

Row2: -3R1 + R2

Row3: -R1 + R3

Row3: 1/2R2 + R3 = L

= U

A =

=

= =