## Math 3321 – Spring 2024

Name:

## Homework #8

You must justify all steps to get credit for your work

Please submit the HW via CASA or email your completed assignment as a single PDF file to jshi24@CougarNet.UH.EDU.

(1)[3 Pts] Let A be a 3x4 matrix, B be a 4x4 matrix, and C be a 4x5 matrix.

(a) Give the size of AB, if the operation is well defined.

(b) Give the size of AC, if the operation is well defined.

(b) Give the size of ABC, if the operation is well defined.

(2)[4 Pts] Consider the following matrices and find the inverse, if it exists. If it does not exist, explain why.

$$(a) \begin{pmatrix} 0 & 1 & -1 \\ 1 & 2 & 0 \\ 0 & 2 & -2 \end{pmatrix}, (b) \begin{pmatrix} 0 & 1 & -1 \\ 1 & 2 & 0 \\ 1 & 3 & -1 \end{pmatrix} (c) \begin{pmatrix} 0 & 1 & -1 \\ 1 & 2 & 0 \end{pmatrix} (d) \begin{pmatrix} 0 & 2 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -2 \end{pmatrix}$$

(3)[3Pts] Determine the values of the parameter k such that the following matrix is invertible

(a) 
$$\begin{pmatrix} 2 & k & -1 \\ 0 & 1 & -1 \\ 1 & 2 & 0 \end{pmatrix}$$
 (b)  $\begin{pmatrix} 2 & k & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 3 \end{pmatrix}$  (c)  $\begin{pmatrix} 2 & k & -1 \\ 1 & 1 & -1 \\ 3 & 3 & -3 \end{pmatrix}$ 

(4)[3 Pts] Use Cramer's rule to give the value of y for the solution set to the system of equations

$$\begin{aligned} -x + 3y + 2z &= -1 \\ -4x + y + 2z &= -1 \\ -x + y + z &= 1 \end{aligned}$$

(5)[3Pts] Consider the vectors

$$v_1 = (1, -1, -3), v_2 = (1, 1, -4), v_3 = (0, 2, -1), v_4 = (2, 0, -7)$$

(a) Is the set  $\{v_1, v_2, v_3, v_4\}$  dependent or independent?

(b) If the set  $\{v_1, v_2, v_3\}$  is dependent, what is the maximum number of independent vectors?

(c) Is the set  $\{v_1, v_2, v_3\}$  dependent or independent?

(6)[4Pts] Find eigenvalues and eigenvectors of  $A = \begin{pmatrix} -1 & 2 \\ 3 & -2 \end{pmatrix}$ .