

Homework 4

188 200 Discrete Mathematics and Linear Algebra

Due: — Monday : August 24, 2009: All homework will be collected at 6:00pm. Any homework submitted after that are late.

Note:

1. All homework must be submitted to the submission box.
2. Submitting homework by email is no longer allowed.

1. Solve the following system of linear equations (i.e. find x_1 , x_2 and x_3) by performing row reduced on the augmented matrix of the system.

$$x_1 + 2x_2 - 3x_3 = 8$$

$$3x_1 + 2x_2 + 9x_3 = 7$$

$$4x_1 + x_2 + 5x_3 = -15$$

2. Find an equation involving g , h and k that makes the following augmented matrix correspond to a consistent system of linear equations. Show and explain each step of your work.

$$\left[\begin{array}{cccc} 1 & -4 & 7 & g \\ 0 & 3 & -5 & h \\ -2 & 5 & -9 & k \end{array} \right]$$

3. Row reduce the following matrix to reduced echelon form. List all pivots and pivot columns.

$$\left[\begin{array}{cccc} 1 & 3 & 5 & 7 \\ 3 & 5 & 7 & 9 \\ 5 & 7 & 9 & 1 \end{array} \right]$$

4. Consider the following system of linear equations then answer questions a – d.

$$x_1 - 7x_2 + 6x_4 = 5$$

$$x_3 - 2x_4 = -3$$

$$-x_1 + 7x_2 - 4x_3 + 2x_4 = 7$$

- a. Write down the augmented form matrix of the system.
- b. Is the system consistent? Justify your answer.
- c. If your previous answer is “yes” then is the solution unique? Justify your answer.

d. Find the solution of the system.

5. Determine if \vec{b} is a linear combination of the vectors formed from the column of the following matrix A . Explain your answer.

$$A = \begin{bmatrix} 1 & -2 & -6 \\ 0 & 3 & 7 \\ 1 & -2 & 5 \end{bmatrix} \quad \vec{b} = \begin{bmatrix} 11 \\ -5 \\ 9 \end{bmatrix}$$

6. Let $\vec{v}_1 = \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} -3 \\ 1 \\ 8 \end{bmatrix}$, $\vec{y} = \begin{bmatrix} h \\ -5 \\ -3 \end{bmatrix}$. Find the value of h that makes \vec{y} in the plane spanned by \vec{v}_1 and \vec{v}_2 .

7. Consider the following system of linear equations

$$\begin{aligned} 8x_1 - x_2 + 2x_3 &= 4 \\ 5x_1 + 4x_2 + 7x_4 &= 11 \\ x_1 + 2x_2 + 3x_3 + 4x_4 &= 3 \end{aligned}$$

a. write the system as a vector equation

b. write the system as a matrix equation

8. Determine if the following matrix span \mathbb{R}^4 . Explain your answer.

$$\begin{bmatrix} 5 & -7 & -4 & 9 \\ 6 & -8 & -7 & 5 \\ 4 & -4 & -9 & -9 \\ -9 & 11 & 16 & 7 \end{bmatrix}$$