

PRINT YOUR NAME _____

Assignment 2B (Due Monday 10/8 beginning of class): Problems on paper

Do the following problems by hand, showing your work. You either can print out these pages and write your work and answers on the printed pages, or you can (neatly) write your work and the answers on your own blank paper. If you do the latter, please leave enough white space for readability and BOX your answers.

Problem 1.

- a) Fill in the blanks to form a complete sentence defining “linearly independent.”

Definition:

A _____ is **linearly independent** if _____

- b) Is the set S of vectors linearly independent? $S = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ 2 \\ 0 \end{bmatrix} \right\}$

Your Reasoning:

Your Answer: (mark one):

Yes, Linearly Independent _____ **No**, not Linearly Independent _____.

- c) True or False? The columns of a 4 x 3 matrix are always linearly dependent.

TRUE _____ FALSE _____

Problem 2:

Find an equation or system of equations that describes the vectors in the span of the column vectors of matrix A. In other words, the set of vector solutions of the equation should be the same set of vectors as the span. (Compare with Example 2.21 in Poole.)

$$A = \begin{bmatrix} 1 & 2 & 0 & 1 & 0 \\ 3 & 6 & 0 & 2 & 1 \\ 4 & 8 & 0 & 1 & 3 \end{bmatrix}.$$

Hint: Row operations on A produce the echelon matrix $M = \begin{bmatrix} 1 & 2 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

Your Reasoning:

Your Equation(s):

Problem 3

For matrix N, matrix P, matrix Q, determine whether or not the columns of the matrix are linearly independent or linearly dependent.

(i) Show your reasoning in each case.

(ii) For each matrix, if the columns are dependent, write down a linear combination of the columns that equals the zero vector so that at least one coefficient of the linear combination is not equal to zero.

(a) Matrix $N = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 1 & 1 \\ -3 & 4 & -5 \end{bmatrix}$

Columns are (check one) Linearly Independent ____ Linearly Dependent ____

(b) Matrix $P = \begin{bmatrix} 1 & 0 & 2 & -1 \\ 2 & 0 & 2 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$

Columns are (check one) Linearly Independent ____ Linearly Dependent ____

(c) Matrix $Q = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 0 \\ 2 & 2 & 1 \\ -1 & 1 & 1 \end{bmatrix}$

Columns are (check one) Linearly Independent ____ Linearly Dependent ____