Linear Algebra
Module 6 Assignment

Due Sunday at 11:59 PM

1 Directions

Complete the following problems showing all your work. You may use a calculator to check your work, but should write out (or TeX up) all the steps of your solution. Unless otherwise specified, you may skip some steps of row reduction with a calculator, but state that you did so. Please upload your work as a single .pdf file to the course.

2 Problems

1. Consider the matrix

$$A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 1 & -1 \\ 2 & 0 & 2 \end{bmatrix}$$

   (a) Compute its rank.

   (b) Find a basis for Col(A)

   (c) Find a basis for Nul(A)

   (d) State the Rank Theorem from the text.

   (e) Show your answers to the previous parts of this question satisfy the Rank Theorem.

2. Let S be a subspace of $\mathbb{R}^4$ spanned by the set of vectors

$$S = \left\{ \begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} -2 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ -2 \\ -5 \end{bmatrix} \right\}$$

   (a) Find a basis for Span S. Perform all row reduction by hand, showing all your steps. (*Hint*: before you start to row reduce, can you remove any obviously linearly dependent vectors in S to simplify the row reduction?)

   (b) State the dimension of Span S.