Practice Test 4

Geronimo

1.a) Consider the matrices

Math 1502

$$i) \quad A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 0 & 1 \\ 3 & 2 & 2 \end{pmatrix} \quad ii) \quad B = \begin{pmatrix} 0 & 1 & 2 & 1 \\ 1 & 2 & 0 & 1 \\ 1 & 4 & 2 & 0 \end{pmatrix} \quad .$$

 $A: \mathbb{R}^n \to \mathbb{R}^m$ for what n and m? $B: \mathbb{R}^n \to \mathbb{R}^m$ for what n and m? Find AB. Find A - 3I where I is the 3×3 identity matrix.

b) Consider the matrix

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

Find a basis for $\operatorname{Col}(A)$. Find a basis for $\operatorname{Nul}(A)$. What is rank A? For an $m \times n$ matrix A why do the pivotal columns form a basis for $\operatorname{Col}(A)$?

2a. Find the eigenvalues and corresponding eigenvectors to the matrix

$$A = \begin{pmatrix} -3 & 1 & 1\\ 1 & -3 & 1\\ 1 & 1 & -1 \end{pmatrix}$$

2b. Find the coordinates of $\bar{x} = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$ in terms of the basis

$$\bar{x}_1 = \begin{pmatrix} 1\\1\\0 \end{pmatrix}$$
 $\bar{x}_2 = \begin{pmatrix} 1\\0\\0 \end{pmatrix}$ $\bar{x}_3 = \begin{pmatrix} 1\\0\\1 \end{pmatrix}$

3a Find $\det A$ where

$$A = \begin{pmatrix} 1 & 2 & 2 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 2 \\ 2 & 1 & 1 & 0 \end{pmatrix}.$$

Suppose A is an $n \times n$ matrix with det $A \neq 0$. Explain whether or not all the columns of A pivotal.

- 3b Find a basis for the subspace of R^4 given by $x_1 + 2x_2 + x_4 = 0$ and $x_2 + x_3 x_4 = 0$. Describe the subspace.
- 4. Find A^{-1} where,

a)

b)
$$A = \begin{pmatrix} 2 & 3 \\ 4 & 3 \end{pmatrix}.$$
$$A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 3 & 2 \\ 2 & 3 & 4 \end{pmatrix}.$$