MAT 2580 Test 3 Review Sheet

Fall 2012

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The questions closely reflect the questions to be asked on Test 3. Please write answers to them and bring them to the class before the test starts.

1. Perform forward elimination on A to construct a matrix row equivalent to A in row echelon form. Use this to determine the rank of A. Show each step of the elimination.
$$A = \begin{bmatrix} 0 & 2 & 3 & -1 & 4 \\ -3 & 1 & 2 & -4 & 2 \\ -4 & 1 & 1 & -4 & 2 \\ 2 & 1 & 1 & 2 & 2 \end{bmatrix}$$
2. Perform backward elimination on B to construct a matrix row equivalent to B in row echelon form. Use this to construct a basis for the null space of B. Show each step of the elimination.
$$B = \begin{bmatrix} 1 & 2 & 4 & -2 & -1 \\ 0 & 0 & 2 & -4 & -2 \\ 0 & 0 & 0 & -4 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$
3. Suppose that $C : 7 \times 10$ has rank 4. How many free variables does the associated homogenenous system of linear equations enjoy?
4. Use `rref` to find a basis for the column space of D.
$$D = \begin{bmatrix} 0 & 2 & 3 & 5 & 2 \\ -3 & 1 & 2 & 0 & 1 \\ -4 & 1 & 1 & -2 & 1 \\ 2 & 1 & 1 & 2 & 1 \end{bmatrix}$$
5. A subspace S of $\mathbb{R}^5$ has dimension 3 and contains $\vec{v}_1$,$\vec{v}_2$, and$\vec{v}_3$ which span S. Explain why $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ is linearly independent.
6. F^{-1} and $\vec{b}$ are given below. Use this information and matrix multiplication to solve $F\vec{x} = \vec{b}$.
$$F^{-1} = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 0 & 1 & 0 \end{bmatrix} \qquad \vec{b} = \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}$$
7. Use `rref` to compute the nullity of G
$$G = \begin{bmatrix} 1 & 2 & 3 & -4 & 5 \\ -3 & 2 & 1 & 4 & 5 \\ 2 & 3 & -1 & -4 & -5 \\ -2 & 1 & 3 & 4 & -5 \end{bmatrix}$$
8. Use the definition of subspace to explain why the set of vectors with at least one zero-coordinate is not a subspace of $\mathbb{R}^3$?