MAS 3105 – LINEAR ALGEBRA FLORIDA INT'L UNIV

REVISION FOR TEST #1

 REMEMBER TO BRING AN 8x11 BLUE EXAM BOOKLET

KEY DEFINITIONS AND MAIN CONCEPTS: (Sections 1.1 - 1.5, 2.1 - 2.3, 3.3)

 Row & column vectors in Rn, inner product of two vectors & length of a vector, Linear equations, Systems of linear equations, Solution set, Equivalent systems, Consistent & inconsistent systems, Type I, II & III operations on equations, Gaussian elimination and back-substitution, Gauss-Jordan elimination, Homogeneous systems, Coefficient Matrix & Augmented Matrix of a system, Upper triangular & Lower triangular matrices, Row echelon form, Reduced row echelon form, Transpose of a matrix, scalar & Matrix multiplication, Diagonal, Identity & Null matrices; Non-singular matrices, Invertible matrices, the inverse of a matrix, Elementary matrices, Trace, definition of Determinant by using permutations, Minors & cofactors, Cofactor expansion along a row or along a column, similar matrices, the vector space Rn, Subspace of Rn, Linear combinations, Span of a set of vectors, Spanning set of a subspace of Rn, Linearly independent set of vectors in Rn.

MAIN PROBLEM SOVING TECHNIQUES OR ALGORITHMS:

1. Solving a system of linear equations: (a) by using Gaussian elimination & back- substitution, (b) by using Gauss-Jordan (complete) elimination.

2. Solving a system of linear equations by converting the augmented matrix [A|**b**] into a standard form and then reading-off the results without using any equations.

3. Finding the inverse of a square matrix by using Type I, II & III row operations.

4. Proving certain facts about matrices, their products, transposes, their inverses & products of these things and when row operations are done to the matrices..

5. Finding the determinant of a square matrix:

 (a) by using the cofactor expansion (b) by using row operations.

6. Proving certain facts involving the determinants of the transposes, inverses & products of square matrices and when row operations are done to the underlying matrices.

7. Determining whether or not a given set of vectors forms a subspace of Rn.

8. Determining if v is in span (v1, … , vk) , or if span (v1, … , vk) = Rn.

9. Determining whether or not a given set of vectors is linearly independent in Rn.

MAIN THEOREMS & FORMULAS:

1. Theorem on the algebraic properties of matrices (Theorem 1.4.1).

2. Theorem about the transpose of a matrix: (AT)T = A, (AB)T = BTAT.

3. Theorem about the inverse of a matrix: (A-1)-1 = A, (AT)-1 = (A-1)T, (AB)-1 = B-1A-1.

4. An nxn matix A is invertible if and only if A is non-singular.

5. Any elementary matrix E is invertible and has an inverse of the same type

6. Theorems about determinants when row operations are done to the underlying matrix.

7. Theorems about trace & determinants : Tr (AB) = Tr(BA), det(A) = 0 iff A is singular,

 det (AB) = det(A) . det(B), det (AT) = det(A), det(A-1) = 1 **/** det(A).

8. Theorem on linear dependence and singularity of associated matrix (Theorem 3.3.1).

9. Theorem on uniqueness of a linear combination (Theorem 3.3.2).