STUDY GUIDE FOR MAS 2103 FINAL EXAM

Be able to do each of the following:

1. Find the inner product, norm and distance.
2. Find the solution of the homogeneous system $A\vec{x} = \vec{0}$; use Gauss elimination on $[A \mid \vec{0}]$ to obtain a row echelon form $[G \mid \vec{0}]$ and use back-substitution to find the solution $\vec{x}$.
3. Identify which columns of G are leading columns, which columns of G are non-leading columns, and which columns will give the free variables in the solution of the system.
4. Find a basis for and the dimension of the null(A), col(A), and row(A).
5. Use the Gram-Schmidt method to construct an orthogonal basis from the basis vectors.
6. Find the least-square solution by solving the associated normal system and the orthogonal projection of $\vec{b}$ on W = col(A).
7. Solve the eigenvalue problem $A\vec{x} = \lambda\vec{x}$ for the eigenvalues and corresponding eigenvectors.
8. Each eigenvalue has an eigenspace. Find a basis for each eigenspace.
9. State the algebraic multiplicity and geometric multiplicity for each eigenvalue.
10. Let AP = PD for the symmetric matrix A and P. Show that P is an orthogonal matrix.
11. Find the eigenvalues of A by solving AP = PD for the diagonal matrix D; show that A = PDP^T.
12. Compute the Wronskian and show that S is a linearly independent set of vectors.