<u>Objectives</u>: Familiarization with MatLab, matrix operations, node and mesh equations, admittance and impedance matrices, etc.   Do this assignment with the goal of developing basic skills and making useful notes that you yourself will continue to refer back to.

1)   Go Thru the on-line MatLab tutorials on matrix operations and take notes for your future reference. Examples of terms or functions to learn about: adjoint, cofactor, transpose, conjugate, inverse, determinant, sparse, topology, reordering, etc. Find corresponding MatLab functions or capabilities. Take notes on MatLab syntax and application "in's and out's" that are of some help. Learn how to save your work to reload and use at a later time.

2)   Use MatLab to solve the matrix equations for the node equations in previous Lectures 1 and 2 notes that are posted on the course web page. (For the second problem, assume E_1 = 120$\underline{/0°}$ V, E_2 = 100$\underline{/-20°}$ V, and E_3 = 120$\underline{/30°}$ V. You'll of course need to learn how to deal with complex numbers here).

3)   Skim your new text. Chapters 7 & 8 of your EE5200 text also contain valuable information on matrix methods for electrical networks. Chapters 9-16 contain a lot of useful references to the analysis applications. Outline the coverage of topics for future reference.

4)   Using the storage method introduced in Lecture 2, put the following matrix into a linked list data structure (draw out the storage vectors and show their contents):

$$\begin{bmatrix} 3 & 0 & 0 & 1 & 0 & 0 \\ 0 & 7 & 0 & 0 & 4 & 0 \\ 0 & 0 & 11 & 8 & 3 & 0 \\ 1 & 0 & 8 & 2 & 0 & 0 \\ 0 & 4 & 3 & 0 & 9 & 0 \\ 0 & 1 & 0 & 0 & 0 & 18 \end{bmatrix}$$

a) Is the above matrix symmetric about the main diagonal? Explain using the word "bilateral."   b) Using a colored pen to indicate changes to the storage vectors, show how we can change the values in the 3,2 and 2,3 positions from 0 to 6 (these dynamic insertions and deletions are done repeatedly in the case of "in situ" algorithms, and this sometimes referred to as "breaking and modifying the chain.") See Chapter 4 for more insight.

5)   Figure out how to use the "sparse" specifier to enter the above sparse matrix into MatLab. Document the procedure. Document what their storage method is (i.e. data structure). Use the MatLab function "spy" to observe the topology of the system that this matrix describes. Relate this to the discussion in Section 4.1 and 4.2 your EE5240 text. Relate also to the concepts of incidence matrices and connection matrices. What is the "percent sparsity" of this matrix?

        While you're at it, learn about the other functions related to sparse matrices: full, find, spconvert, nnz, nonzeros, nzmax, spones, spalloc, issparse, and spfun.