ASSIGNMENT # 1 LEONTIEF INPUT OUTPUT MODEL

Read carefully section 2.6 (page 152) in our text book, then do the following:

A. What is the difference between the intermediate demand vector, the final demand vector, and the production vector?

B. Describe the unit consumption vector for a sector. Describe the consumption matrix. What does the product of the consumption matrix and the production vector give you?

C. a) What conditions are sufficient for the matrix $(I - C)$ to be invertible? Is this likely in practice? Why?
b) What is the significance of the entries in column j in $(I - C)^{-1}$?
c) What would it mean for the (i, j) entry in $(I - C)^{-1}$ to be 0? Why?

D. Do the following exercises from the book.

Problems 1,2(you may use an inverse or multiply the matrix equation by 100 to remove the decimals and then solve) ,5,6,7 and 10.

ASSIGNMENT # 2 COMPUTER GRAPHICS

Carefully read section 2.7 (page 158) in our text book, including the examples and the practice problems, then do the following:

A. Describe how homogeneous coordinates can be used to translate an object.

B. Do the following exercises from the book:

Problems 1,2,3,4,5,6,7,8, 10(give a reason for each answer), 17,18. Be sure to show your work.

ASSIGNMENT # 3 MATRIX FACTORIZATION

Read carefully section 2.5 (page 142) in our text book, then do the following:

A. There are matrices for which no LU decomposition exists. Describe such matrices.

B. Do the following exercises from the book:

Problems 1,6,9,10,13,15,29.

C. The second part of the algorithm for an LU factorization says "place entries in L such that the *same sequence of row operations* reduces L to I". Take the matrix L that you found in # 9 and perform on L the same sequence of row operations that you used in the first part of the algorithm.

ASSIGNMENT # 4 TEMPERATURE DISTRIBUTION

Read Chapter 11, Equilibrium Temperature Distribution in Applications of Linear Algebra by Rorres and Anton. Then do the following:

The matrices are not small. To do the computations use the linear algebra package available with SAS, or some other mathematical software. Directions for using SAS are available elsewshere.

A. The components of the vector $\vec{b}$ are different depending on whether the mesh point is in the interior of the region or the mesh point is adjacent to an edge. What is the value of the component for a mesh point in the interior? What is the value of the component for a mesh point that is adjacent to an edge?

B. Do the following exercises:

1. Problems #33, 34 in our text.

2. Problem 11.1 in Rorres and Anton.

3. Repeat Problem 11.1 but change the temperatures. Keep the temperature at the left two points at 0, change the temperature at the bottom two points to1, change the temperature at the two points on the left to 2 and change the temperature at the two points on the top to 3. Repeat the procedure for 11.1 a) ,b) and c).

3. Problem 11.3 in Rorres and Anton.

4. A plate, shown below, has boundary temperatures as given in the diagram. A net with 9 interior mesh points is overlaid on the plate.

a) Using the discrete mean value property, write the 9x9 linear system $\vec{t} = M\vec{t} + \vec{b}$ which determines the approximate temperature at the nine interior mesh points.

b) Solve the linear system found in part a)

c) Use the Jacobi iteration scheme with $\vec{t}^{(0)} = \vec{0}$. Find $\vec{t}^{(1)}, \vec{t}^{(2)}, \vec{t}^{(3)}, \vec{t}^{(4)}, \vec{t}^{(5)}$.