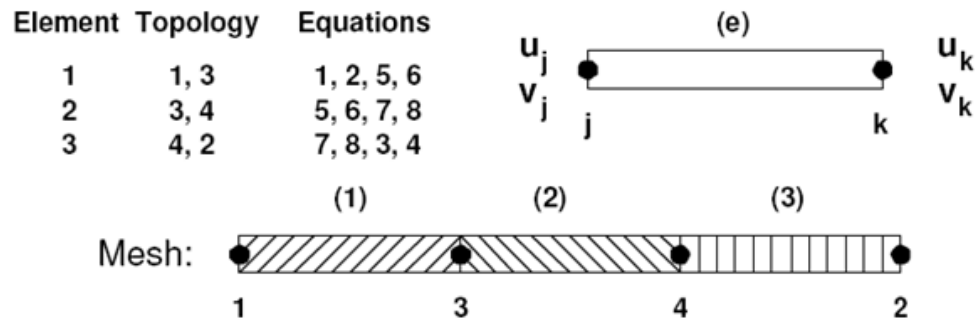


Mech417 HW 4 assigned 2/5/09, hardcopy due 2/12/09 5pm at "In Box"

- When there is more than one unknown degree of freedom (DOF) at each node the assembly process changes slightly. Let n_g be the number of generalized DOF at each node. Then the local DOF equation (row or column) number, say k , depends on the node and DOF selected (for $1 \leq J \leq n_g$). The local equation numbers are still converted directly to system equation numbers, say K , for gather or scatter operations. However, we now need to calculate the equation numbers as

$$\begin{aligned} \text{Local:} \quad & k(i, J) = n_g(i - 1) + J \quad 1 \leq i \leq n_n \quad 1 \leq J \leq n_g \\ \text{System:} \quad & K(I, J) = n_g(I - 1) + J \quad 1 \leq I \leq n_m \quad 1 \leq J \leq n_g \end{aligned}$$

where n_n and n_m are the number of element nodes and number of system nodes, respectively, and where I is the system node corresponding to local element node i in the mesh connectivity (topology) list. Use these equations to find the four local and system equation numbers for each of the three elements shown below.



- (Due March 26, 2009)** This course mainly covers the theory of finite elements and simple implementations via Matlab scripts. However, I do require that you have a minimum exposure to commercial software, like CosmosWorks and ANSYS which are on the computers in ME 241 and the Fondren library. Therefore, if you have not previously done so, I require that you go through three basic tutorials using CosmosWorks. To begin the program use **Start→Programs→SolidWorks→CosmosWorks**. Then **Help→CosmosWorks→On Line Tutorials** will give you the tutorial selection list. Complete the 1) Static analysis of a part, 2) Thermal analysis, and 3) Frequency analysis tutorials.

When you open a tutorial file, immediately save it under a new name with your initials inserted at the front (via File→Save As). That prevents the standard tutorials from being corrupted. Begin a log of the tutorials. For each tutorial, give the title, the date completed, and a couple of sentences with your impression of the educational or practical value of the tutorial. When done, turn in that hardcopy. If a tutorial opens with a "study" included just create a new study with a different name.

Note: You ID card should open the building and ME241 doors any time (try it). It not get it activated in room ME 101 or use the software in Fondren library.

Mech 517 only

3. Explain why the sum of the Gaussian quadrature weights tabulated over $0 \leq r \leq 1$, must equal unity, while those tabulated over $-1 \leq a \leq 1$ must sum to 2.
4. **(Due March 26, 2009)** Complete one other CosmosWorks tutorial.