ME 478 Homework #3 Due: April 17th, 2012 before class.

Please show your work and draw a box around your answer to receive full credit.

Readings: Chapter 4.1-6

1) The derivative of the strain energy with respect to each nodal displacement/rotation is

$$\frac{\partial \Lambda^{(e)}}{\partial U_i} = \frac{EI}{2}\int_0^L \{U\}^T[D]^T[D]\{U\}dx = EI\int_0^L [D]^T[D]dx\{U\}$$

where [D] = [D_{i1} , D_{i2} , D_{j1} , D_{j2}] and {U} = {U_{i1} , U_{i2} , U_{j1} , U_{j2}}^{T}. To reinforce this concept, show that

$$\begin{Bmatrix} \frac{\partial}{\partial U_{i1}}\left(\{U\}^T[D]^T[D]\{U\}\right) \\ \frac{\partial}{\partial U_{i2}}\left(\{U\}^T[D]^T[D]\{U\}\right) \\ \frac{\partial}{\partial U_{j1}}\left(\{U\}^T[D]^T[D]\{U\}\right) \\ \frac{\partial}{\partial U_{j2}}\left(\{U\}^T[D]^T[D]\{U\}\right) \end{Bmatrix} = 2[D]^T[D]\{U\}$$

2) Chapter 4, Problem 7. Use Matlab to solve and submit your DIARY file along with your hand-written work for the problem. Draw boxes around the output for the displacements and the reaction forces/moments.

3) Chapter 4, Problem 9. Use Matlab to solve and submit your DIARY file along with your hand-written work for the problem. Draw boxes around the output for the displacements.