Summary: Castigliano w/ indeterminate structures

- *Indeterminacy and redundant reactions:* Statically indeterminate structures are recognized as those structures for which the number of reaction loads exceeds the number of available equilibrium equations. Let N_R be the number of "excess" (or "redundant") reactions for an indeterminate structure.

- *Castigliano's 2nd theorem for indeterminate structures:* Let R_i ; i = 1,2, …, N_R be the set of redundant reactions in the structure. These redundant reactions are found from the following equations: $0 = \dfrac{\partial U}{\partial R_i}$; $i = 1,2,...,N_R$

- *Comments:*
  - *How do you choose the redundant reactions?* That choice is YOURS. Choose any of the N_R reactions as your redundant reactions.
  - *How do you solve for the reactions?* Your equilibrium equations (found from your FBDs) along with the N_R Castigliano equations above will provide you with the correct number of equations for these reactions.
  - If displacements are also needed, then use Castigliano's equations to find the displacement at the location of the ith applied load P_i: $\Delta_i = \partial U / \partial P_i$ Note that you must solve for the reactions BEFORE before solving for displacements.