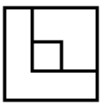
Homework for 16.00
Introduction to Aerospace Engineering and Design
Professors Weigel and Newman

Problem Set #4
Handed out 26 Feb 2004
Due 11 Mar 2004

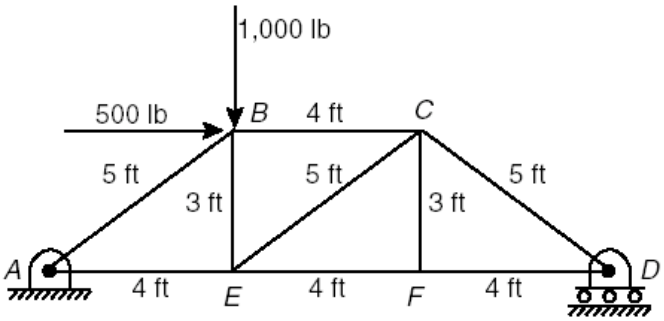
1. (20 points) Drawing. The following puzzle is meant to give you practice with orthographic projections, specifically, multiviews. For the puzzle shown, a top view and front view are provided. Sketch the side and isometric views. Make sure your drawings are neat.



2. (10 points) Structural supports. Go on the internet, and find three objects from real life that illustrate each of the three different kinds of structural supports: roller, pin, and clamp. (You may not use the same examples presented in class.) Clip the images of the three objects from the internet for inclusion in your written answer, and clearly identify which type of support each picture is illustrating, including markings to indicate where precisely the specified type of support is located on the object. Be sure to properly cite a reference for each of your pictures. Then, pick one of the objects, and represent it with a free body diagram, clearly labeling all forces.

3. (10 points) Design assessment. You are a structural engineer for NASA. Point out two strengths and two weaknesses of the current Space Shuttle's structure. Based on your knowledge of engineering, as well as a good web search on the structural design of the Space Shuttle, suggest improvements and revisions. Be sure to properly cite any references (papers, reports, web pages, etc.) obtained through your web search.

4. (40 points) Method of joints analysis (Problem 5.5 from course text) For the nine-member truss shown below:



(a) Draw a free-body diagram, and solve for the reactions.
(b) Solve for the loads in all members, using the method of joints. Carefully sketch each joint, and be sure to indicate tension versus compression.
(c) Draw a final sketch with all external forces, reactions, and internal loads labeled.
(d) What checks are available to ensure that your answer is correct?

4. (20 points) Propulsion. Select two aircraft or spacecraft.
(a) List a few examples of the primary requirements for engines on your selected crafts.
(b) Consider your two choices and their primary flight function. How do they differ? What should an engineer be most concerned about when designing each engine?