**HW 5 Due Wednesday Feb. 26**

[Problems numbers are from revision (d) of the book.]

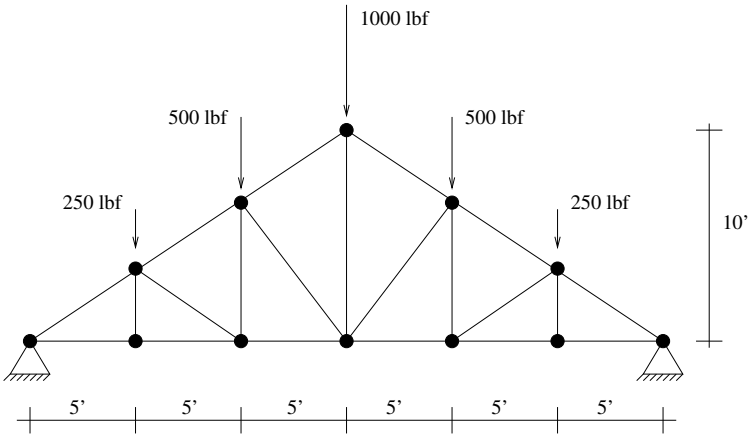
1. (MATLAB Problem, 20 pts) Consider the Pratt roof truss shown below. Assume that the members are 2x4 wood sections that are assumed to be connected by pin joints.

   (a) What is the largest magnitude compressive force in the truss and where does it occur?

   (b) What is the largest magnitude tensile force in the truss and where does it occur?

   (c) If the truss is made statically determinate by changing the right support to a horizontal roller, how does your answer change?

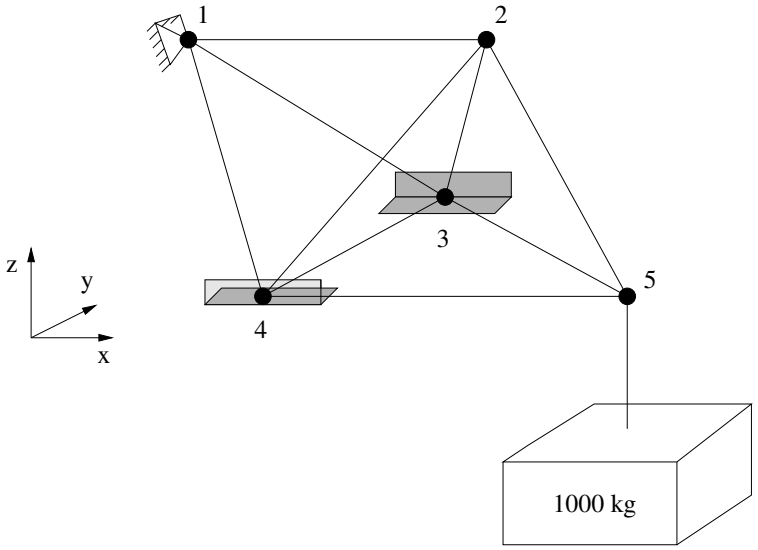
   [Note: (1) A 2x4 is not 2 inches by 4 inches! (2) You will need to assume a reasonable value for Young's modulus of construction lumber. (3) For Part 1c the values of $A$ and $E$ should play no role – test your program to verify.]



2. (MATLAB Problem, 20 pts) Consider the space truss shown below. Assume node 1 is fixed. Assume that nodes 3 and 4 are free to roll in the $x$-direction but are otherwise constrained and that the load at node 5 is in the negative $z$-direction. Let $A = 1000$ mm$^2$, $E = 210 \times 10^3$ N/mm$^2$, and assume Earth's gravitational acceleration acts in the negative $z$-direction. The coordinates of the nodes are

$$\begin{aligned}
\boldsymbol{x}_1 &= 500\boldsymbol{e}_y + 500\boldsymbol{e}_z && \text{(mm)} \\
\boldsymbol{x}_2 &= 700\boldsymbol{e}_x + 700\boldsymbol{e}_y + 500\boldsymbol{e}_z && \text{(mm)} \\
\boldsymbol{x}_3 &= 500\boldsymbol{e}_x + 800\boldsymbol{e}_y && \text{(mm)} \\
\boldsymbol{x}_4 &= 500\boldsymbol{e}_x + 100\boldsymbol{e}_y && \text{(mm)} \\
\boldsymbol{x}_5 &= 1200\boldsymbol{e}_x + 100\boldsymbol{e}_y && \text{(mm)}\,.
\end{aligned}$$

Find the $x, y, z$-displacement of node 5.




3. (10 pts) Book Problem 3.1

4. (10 pts) Book Problem 3.5(a,b)

5. (10 pts) Book Problem 3.6