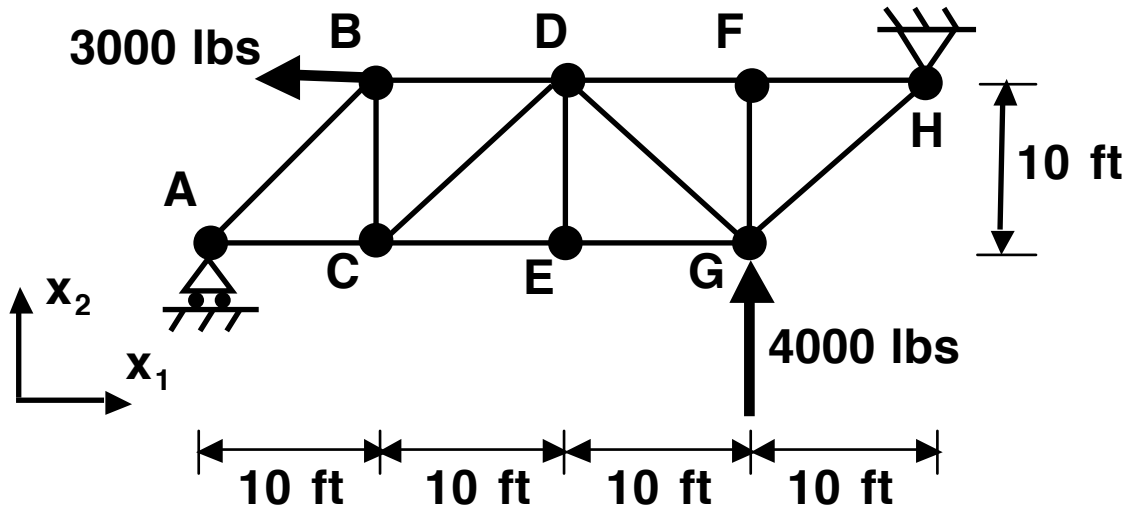
Unified Engineering Problem Set **Lectures: M7, M8,**
Week 5 Fall, 2007 **M9, M10** ***(some look-ahead)***
Units: M1.4, M1.5 ***(some look-ahead)***

M5.1 ***(20 points)*** A 10-foot high truss has a 40-foot span and is made up of thirteen individual bars of various lengths in four bays as shown in the accompanying illustration. Each bay of the truss is 10 feet long. The truss is simply-supported being attached via a roller support at the left end and pinned at an elevated point at the other. Loads are applied at various joints as noted.



(a) Draw the free body diagram for this situation.

(b) Determine the reaction forces.

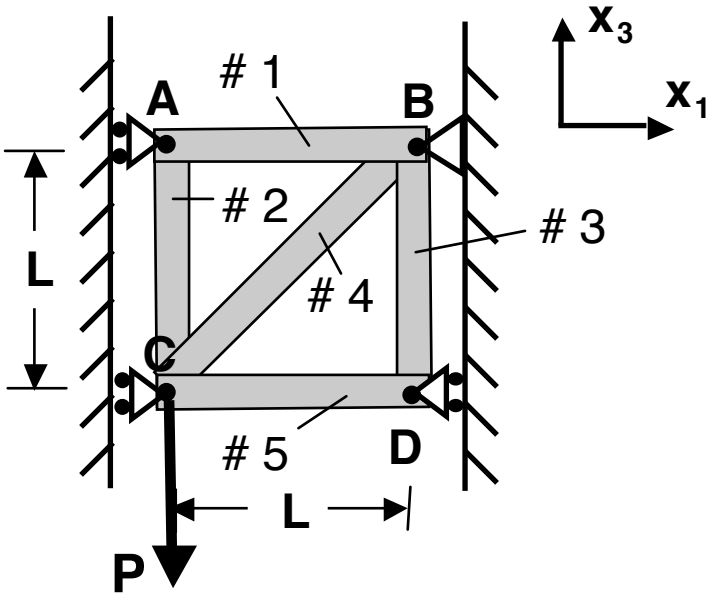
(c) Without performing any calculations, can you determine if there are any bars in the truss that carry no load? Which are they? Explain clearly.

(d) Determine the load in all the bars using the *method of joints*. Draw a clear diagram showing the entire configuration and the manner in which loads are carried.

(e) Check the results for the loads in the bars of the second bay (bars BD, CD, and CE) by the *method of sections*.

M5.2 ***(10 points)*** **SOME LOOK-AHEAD:** ***Use final parts of M1.5 notes and M1.5EX notes***

A five-member truss arrangement between two walls in a structural configuration is used to resist a load applied vertically as in the illustration. The truss dimension between the walls is L as is the overall dimension of the truss in the other direction. The diagonal bar is connected to two outer bars at a pin support at the upper right hand corner of the truss. All other joints are supported via roller supports.



(a) Determine the manifestation of the Compatibility of Displacement for this configuration in terms of the deflections of each of the roller supports, and the associated deflections of each of the bars.

(b) If it is assumed that the deflections are small, can anything be done to linearize these equations? Clearly explain and show resulting equations.

(c) Comment on how the approach to solve an overall set of equations involving those from the Compatibility of Displacement is effected in the case where the deflections can be assumed "small" versus when they become relatively "large".