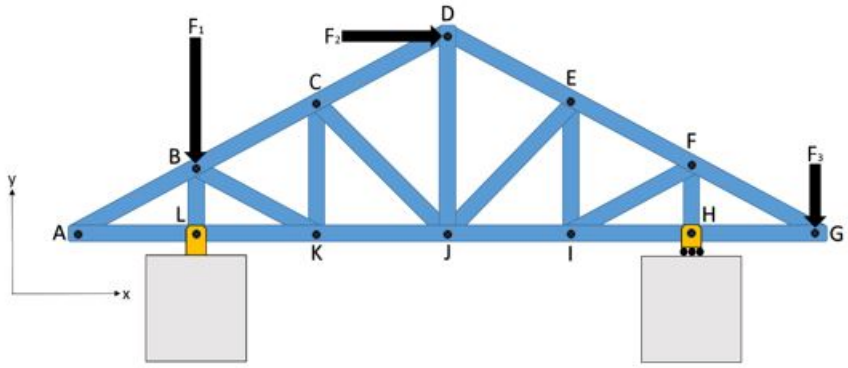
TAM 210/211 Written Assignment 8 (due on March 10th)

Local merchant and carpenter Ron Swanson has decided to open his own breakfast diner. Although he is a skilled craftsman, there are external conditions he does not know how to account for in his construction of the truss at the entrance to the diner (shown below). He needs your help in the following problems.



Ron has given us the dimensions for the members of the truss as follows:
$AB = BK = BC = CK = KJ = JI = EI = FI = EF = FG = 1$ m,
$AL = LK = IH = HG = \sqrt{3}/2$ m. BL, CK, EI, and FH are all perpendicular to AG.
The first problem Ron needs us to help with involves the following external forces being applied:
$F_1 = 200$ N in the $-y$ direction at point B, $F_2 = 150$ N in the $+x$ direction at point D,
and $F_3 = 50$ N applied at point G in the $-y$ direction.

1. (a) Draw a free body diagram of the truss to obtain expressions for the reaction forces at L and H and calculate their values.
   (b) Identify all zero-force members.
   (c) Use the method of sections to determine the internal forces in members CJ and EI. Are these members in tension or compression?
   (d) How would the forces in BK and KJ change if member CJ breaks?

2. Ron has a tough time using technologies of the day (in fact he still has a Nokia brick phone,but only for emergencies). He needs your expertise in Matlab (or other computing software) to determine the following results through plotting tools.

   (a) Find the internal forces in members EJ, determining if it is in compression or tension (May also be done by hand).

   (b) Suppose F_2 is applied to joint D at some angle, θ (Anti-clock wise), above the positive x-direction (as shown, $\theta = 0$). Determine an expression for the internal forces in members CJ and EJ in terms of θ.

   (c) At what angle of θ are the internal forces of members CJ and EJ members equal. [Restrict θ between 0 and 2π]

   (d) At what angle is member EJ a zero force member.

   (e) What do we notice about member EJ as θ increases? Compare from what you notice about member CJ?