LESSON OBJECTIVES
1. Solve an indeterminate moment diagram, based on a qualitative moment diagram, given information about inflection points or member end-moments.
2. List the assumptions of the portal method and describe when it is applicable.
3. Solve a rigid frame by the portal method and plot its moment diagram.

TEXTBOOK: Hibbeler Chapter 7 – Approximate Analysis of Indeterminate Structures – Portal Frames (7-4, 7-5)

QUALITATIVE MOMENT DIAGRAM CLUES:
0. MOMENT IS PROPORTIONAL TO CURVATURE
1. ALWAYS: One function between point Forces*. Uniform=>Parabolic. PointLoads=>Linear
2. Draw Elastic Deformed Shape => Curvature. Think about:
   - Displacement
   - Slope
   - Curvature
   Make these consistent with one another
3. Moment springs produce counterflexure (they oppose the rotation that would otherwise occur)
4. Joints must be in moment equilibrium.
5. (New, Today). Moments distribute in proportion to stiffness, at a joint.
6. (New, Today, but will be proven, next week).

THE PORTAL METHOD:
- Used for finding moments in rigid frames, subjected to lateral loads
  1. Assume Inflection Points at midpoint of all beams and columns.
  2. Assume story shear is distributed equally to each bay.
  3. Assume that the bay shear is distributed equally to the adjacent columns.
- Solution Methods:
  1. Basic Approach: Solve every determinate, pin-ended free-body diagram (See Hibbeler, Chapter 7)
  2. Quick Approach:
     1. Determine all column moments (equal to column shear, times distance)
     2. Moment equilibrium of joints = > beam moments.
     3. Beam shear = Beam moment, divided by distance.

HOMEWORK ASSIGNMENT (DUE FRIDAY, 5PM)
Plot all moment diagrams using the Strength of Materials Convention (plot on the compression side), unless noted otherwise.
1. Consider the rigid frame, below using the Portal Method (all connections and foundations are moment-resisting). Plot the moment diagram for the frame (beams and columns), reporting all values. You can show all work on the frame, if you wish to (i.e., you may not need to show every little FBD, individually)
2. Referring to the previous frame, solve the FBD’s necessary in order to report what the column tension is at point A.

3. Plot the moment diagram for the frame, determining and labeling all local min/max values.
   Given: All connections are rigid. Beam BC has inflection points that are:
   - 3 ft to the right of point B, and
   - 3 ft to the left of point C

4. Plot the moment diagram for the frame, determining and labeling all local min/max values.
   Given: the moment magnitude at A is 12 kip-ft. Column AB has the same EI as Beam BC, which is twice as high as the EI of Column BD.