Announcements

- Quiz 3 retry this week

- Upcoming deadlines:
  - Friday (3/1)
    - Written Assignment
  - Tuesday (3/5)
    - PL HW
Objectives

- Truss Analysis
  - Zero-force member
  - Method of section
Zero-force members (ZFM)

- Particular members in a structure may experience no force for certain loads.
- Zero-force members are used to increase stability.
- Identifying members with zero-force can expedite analysis.
- Requirement: No external force/support reaction on the pin for analysis.

Two cases (use pin analysis):
1. Two non-collinear members.
2. Two collinear members + a third non-collinear member.
Which are zero-force members?
How many zero-force members are in the truss?

1. ZFM
2. ZFM
3. ZFM
4. ZFM
5. ZFM
6. ZFM

$\rightarrow 6$ ZFM here.
Internal forces

- How are two-force members being held together internally?

Tension  
Compression

same magnitude

→ external forces & internal forces of truss members are the same.
Method of sections

- Determine external support reactions
- “Cut” the structure at a section of interest into two separate pieces and set either part into force and moment equilibrium
- Be aware of number of unknowns after your cut!

\[ \Sigma F_x = 0 = F_{bc} + F_{AC} \cos 45^\circ + F_{GF} \]
\[ \Sigma F_y = 0 = F_{bc} \sin 45^\circ - 1000 \text{N} \]
\[ \Sigma M_5 = 0 = -F_{bc} (2m) + (1000 \text{N})(2m) \]

→ 3 equations of equilibrium are sufficient to solve for the 3 unknown forces on members BC, GC, and GF.
Determine the force in members $E_1$ and $J_1$ of the truss which serves to support the deck of a bridge. State if these members are in tension or compression.

Method of section

- $F_{EF}$, $F_{F1}$
- $F_{E1}$, $F_{J1}$

Note: when using method of section, cut through at most 3 members at a time.

- Use FBD of the whole truss to find $G$.

$\sum M_A = -(9 \text{ ft})(4000 \text{ lb}) - (18 \text{ ft})(8000 \text{ lb}) - (45 \text{ ft})(5000 \text{ lb}) + (54 \text{ ft}) G = 0$

$= 7500 \text{ lb}$

- Use the right section to find $F_{EF}$.

$\sum M_I = (12 \text{ ft}) F_{EF} - (9 \text{ ft})(5000 \text{ lb}) + (18 \text{ ft})(7500 \text{ lb}) = 0$

$\implies F_{EF} = -90000 \text{ lb} \ (compression)$