Announcements

- Check your grades on compass (-- ≠ 0)
- Quiz 3 starts tomorrow
- Visual representation study participation consent form

PL HW

☐ Upcoming deadlines:

- Friday (10/12)
  - WA
- Tuesday (10/16)
  - PL HW

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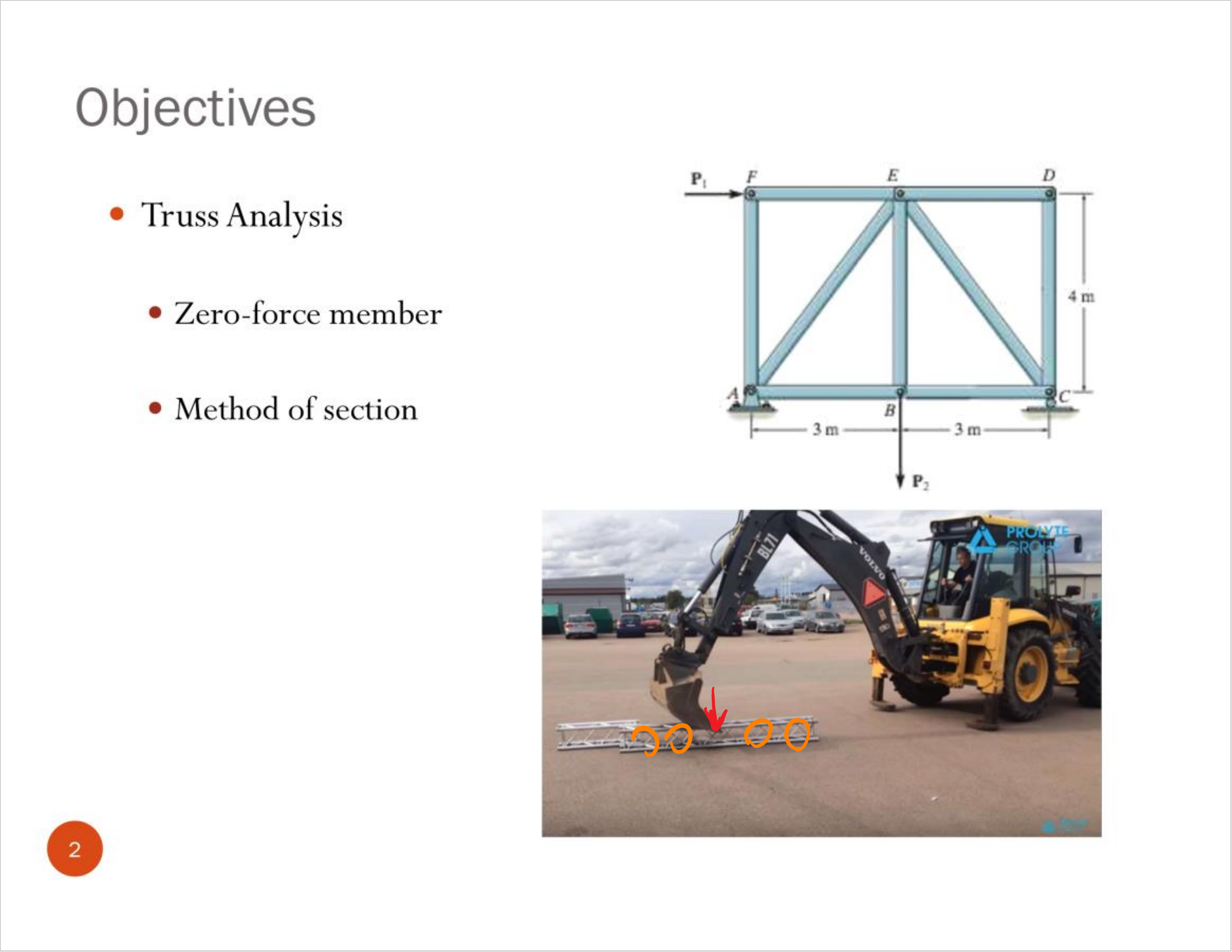

Objectives

- Truss Analysis
  - Zero-force member
  - Method of section

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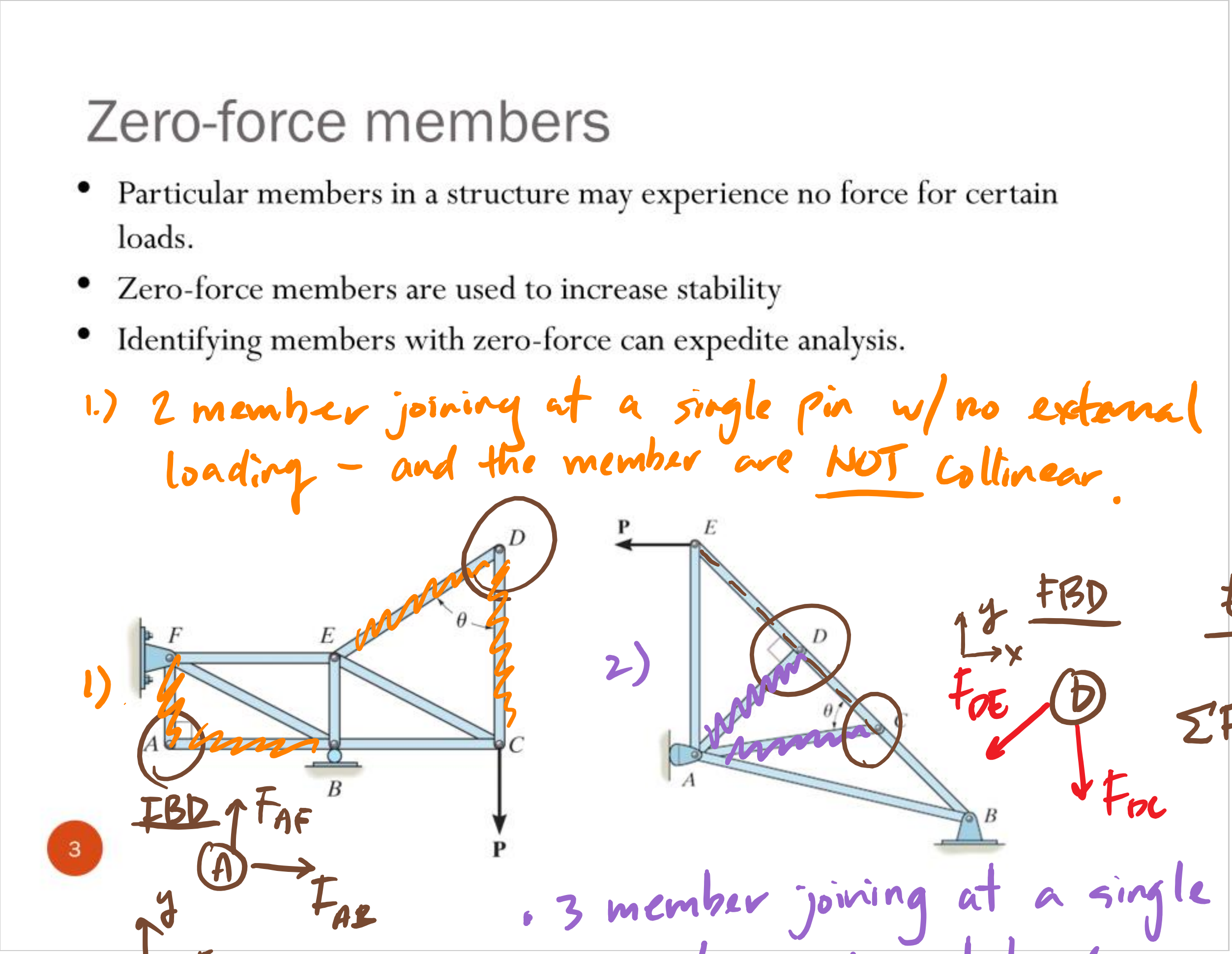


Zero-force members

- 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.

1.) 2 member joining at a single pin w/no external loading - and the member are NOT collinear.

FBD F_{AF} A F_{AB} y x

FBD y x F_{DE} D F_{DC}

EoE

$\Sigma F_x = -F_{DEx} = 0$

$F_{DE} = 0$

→ $F_{DC} = 0$

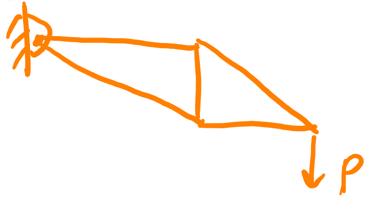
- 3 member joining at a single pin w/no external loading.
- If 2 members are collinear, then the third must be a zero force member.

EoE

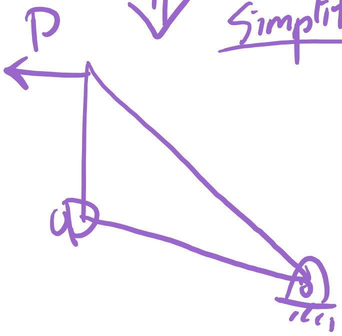
$\Sigma F_x = F_{AB} = 0$

$\Sigma F_y = F_{AF} = 0$

Simplified ⇓ Truss

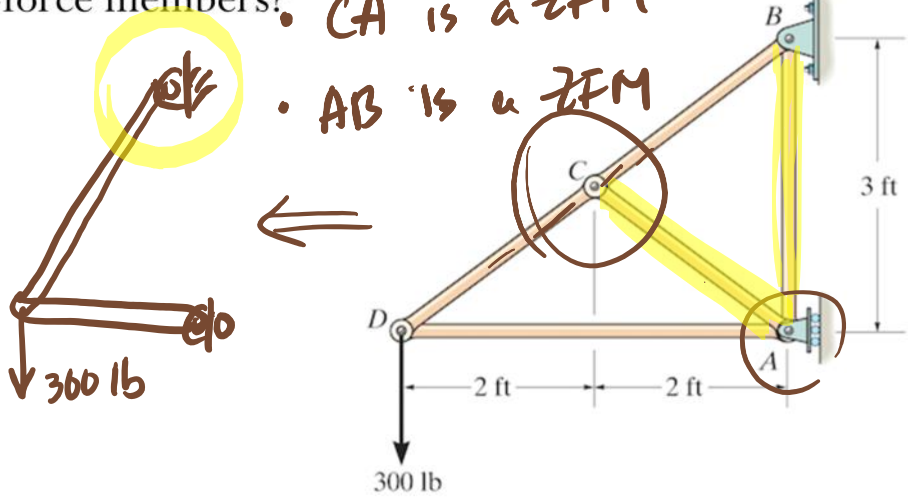


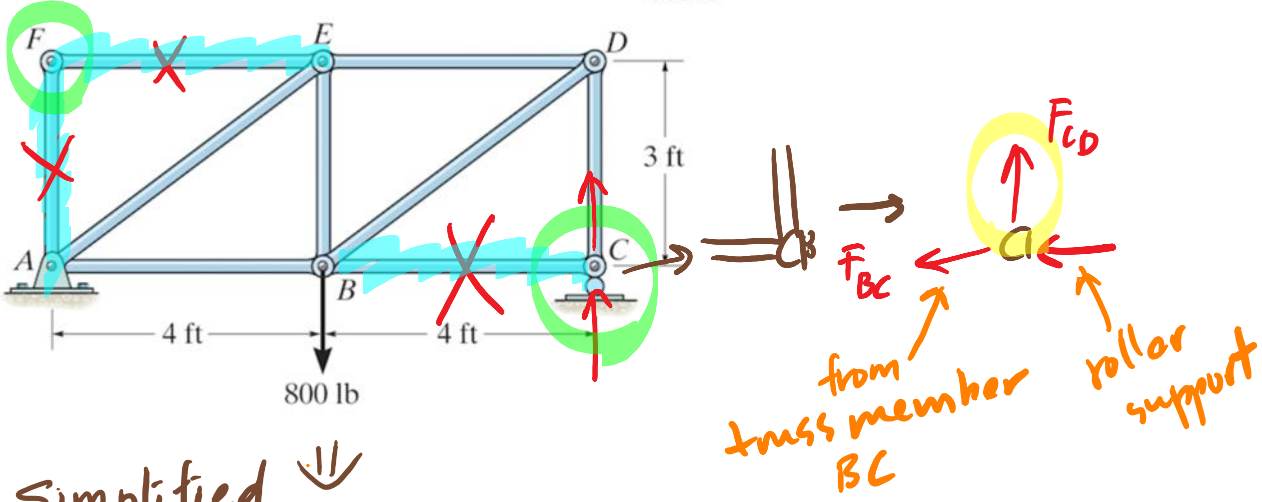
⇓ Simplified truss



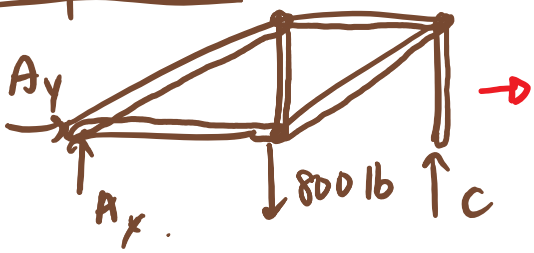
Which are zero-force members?

- CA is a ZFM
- AB is a ZFM





Simplified ⇓



→ CB, AF, & FE are ZFM.

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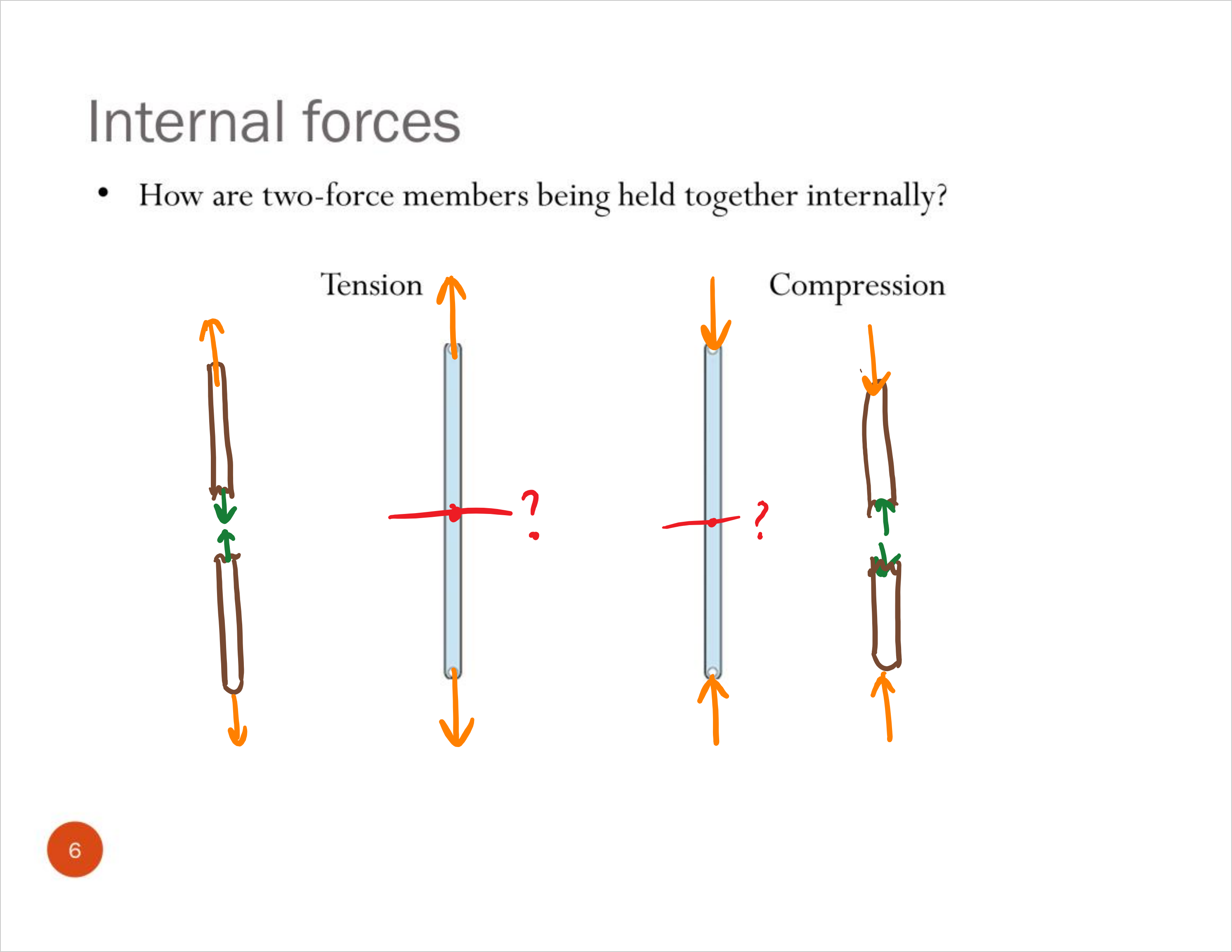

Internal forces

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

Tension

Compression

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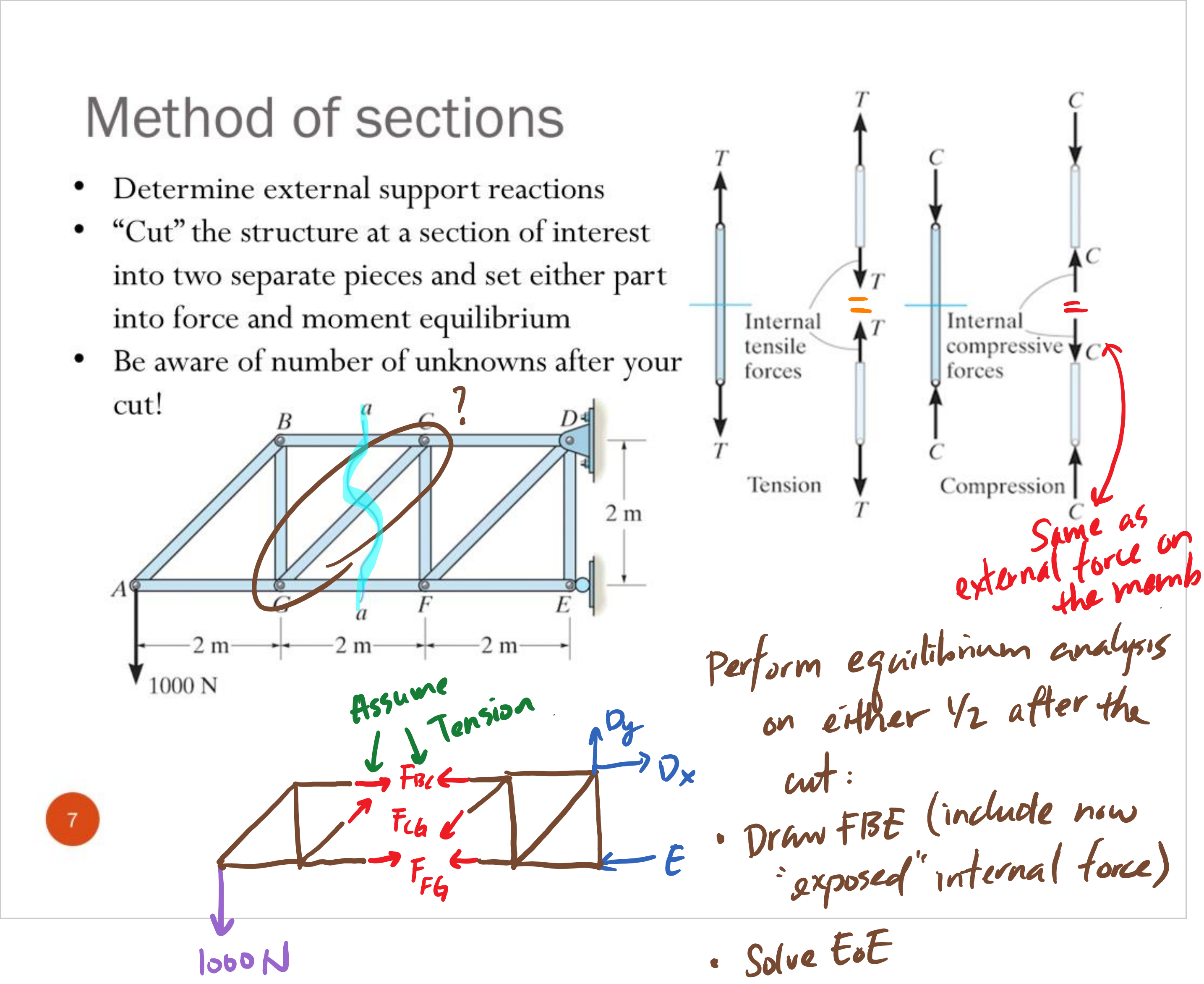


Method of sections

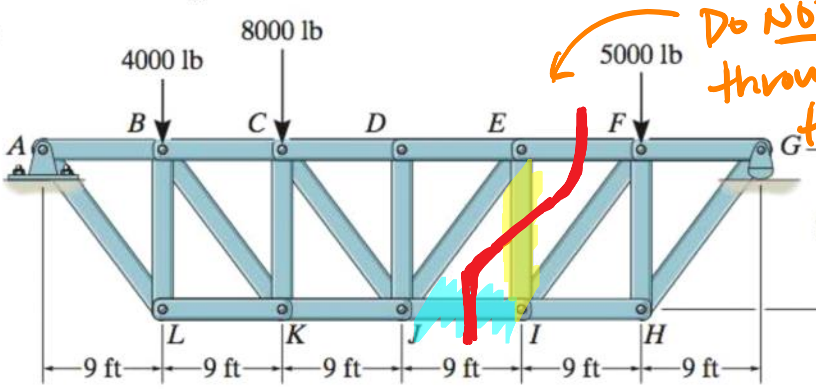
- Determine external support reactions
- "Cut" the structure at a section of interest into two separate pieces and set either part into force and moment equilibrium
- Be aware of number of unknowns after your cut!

Same as external force on the member.

Perform equilibrium analysis on either 1/2 after the cut:

- Draw FBE (include now "exposed" internal force)
- Solve EoE
- Good for finding force on a member in the middle of a complex truss.

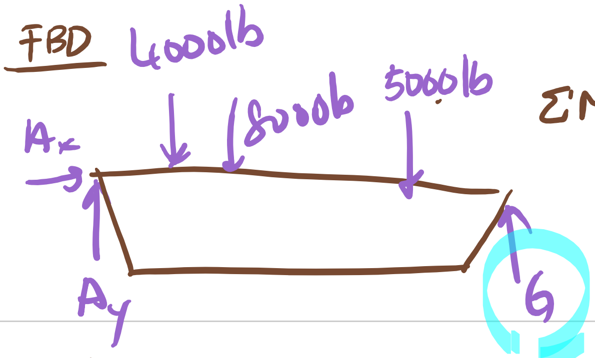
Determine the force in members *EI* and *JI* of the truss which serves to support the deck of a bridge. State if these members are in tension or compression.



Do NOT cut through more than 3.

I. Perform equilibrium analysis on the whole truss to find support reactions at A & G.

FBD

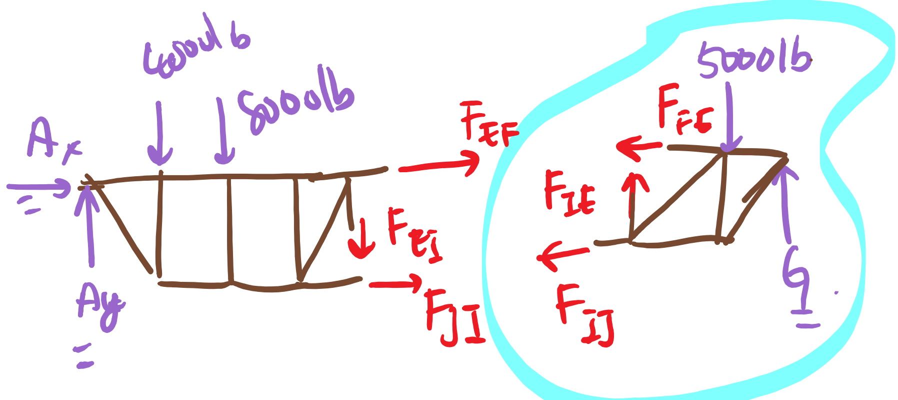


EoE

$$\Sigma M_A = -(4000lb)(9ft) - (8000lb)(18ft) - 5000\,lb\,(45\,ft) + G\,(54\,ft) = 0$$

$$\Rightarrow \boxed{G = 7500 lb}$$

II. Cut the truss into 2 through EF, EI, and IJ to expose internal forces for EI and IJ



III. Choose a section (left or right) to perform equil. analysis

For EI

$$\sum F_y = F_{IE} - 5000\,lb + G = 0$$

$$\boxed{F_{IE} = 5000\,lb - G = -2500\,lb}$$

negative sign means tension assumption is wrong, IE is actually in compression.

For JI

$$\sum M_E = -F_{IJ}(12ft) - (5000lb)(9ft) + G(18ft) = 0$$

$$\boxed{F_{IJ} = \frac{-45000 + 18G}{12} = +7500\,lb}$$

tension