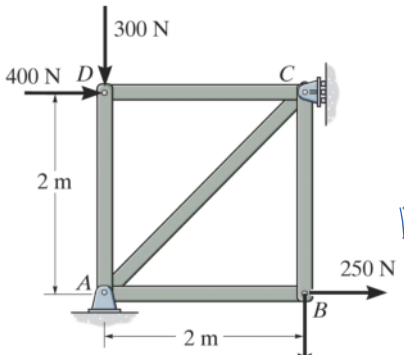
Lec16

Wednesday, October 28, 2020 7:57 AM

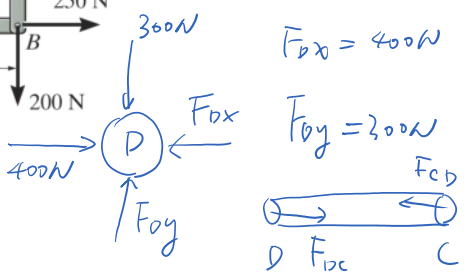


i-Clicker Time

Is member *CD* in tension or compression?

A) Tension

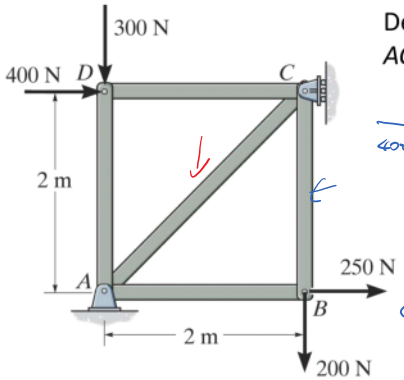
B) Compression



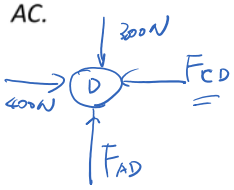
$F_{Dx} = 400N$

$F_{Dy} = 300N$

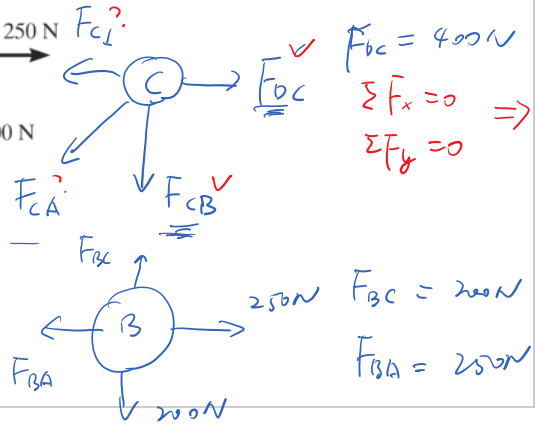
1



Determine the force on member *AC*.



$F_{CD} = 400N$



$F_{DC} = 400N$

$\Sigma F_x = 0 \Rightarrow F_{CA} = ?$

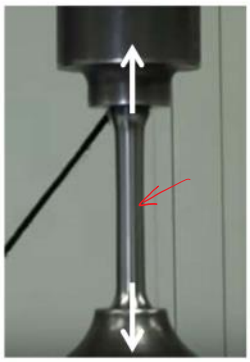
$\Sigma F_y = 0$

$F_{BC} = 200N$

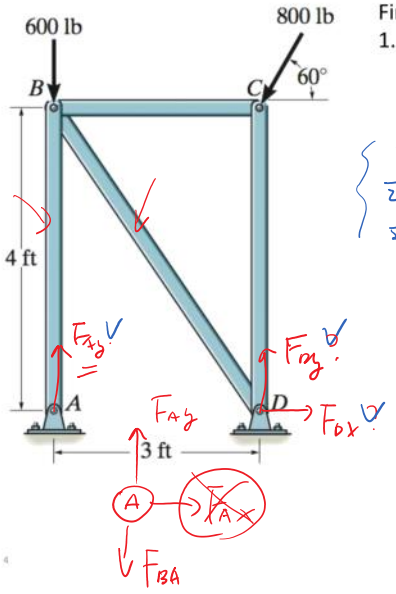
$F_{BA} = 250N$

2

Tension vs. Compression



Rigid bodies respond differently to tension versus compression. (YouTube Clips)

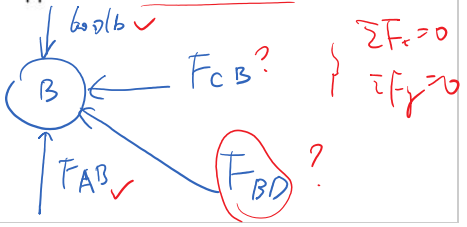


Find the forces in member *BD*.

1. Find support reactions.
   Problem: the truss has too many unknowns (2 force components at both *A* and *D*)

$\Sigma F_x = 0$
$\Sigma F_y = 0$
$\Sigma M_D = 0$ ⇒

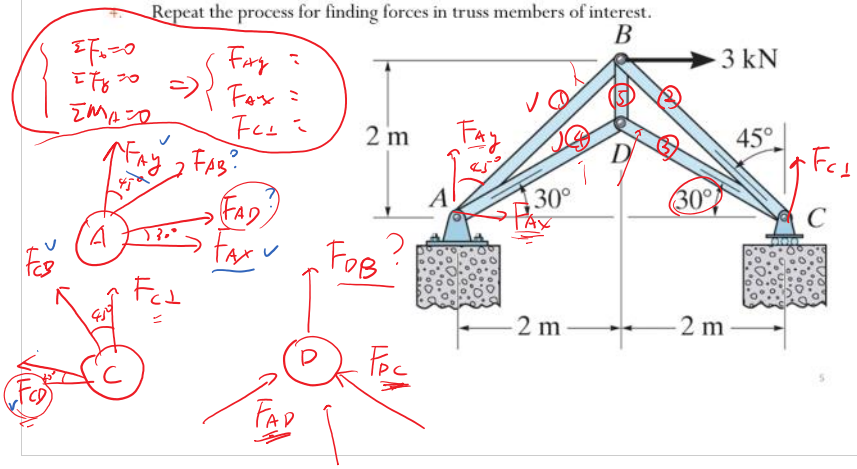
Tip: Notice pin *A* is connected to a truss member and pin support *A*, so the support reactions at *A* can only provide a support force equal and opposite to truss member *AB*.



We will determine the force in each member of the truss and indicate whether the members are in tension or compression.

Procedure for analysis:

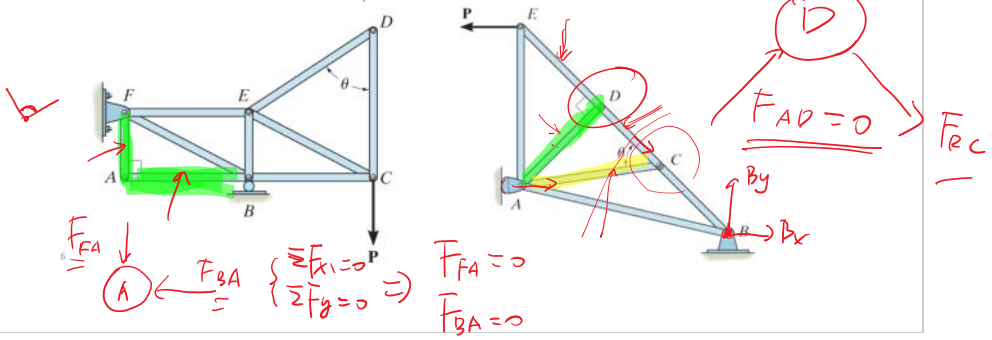
1. Draw a FBD of the whole truss and find the external reactions at the supports.
2. Draw a FBD of a joint with at least one known force and at most two unknown forces.
3. Use equations of equilibrium for the joint to solve for the unknown forces.
4. Repeat the process for finding forces in truss members of interest.



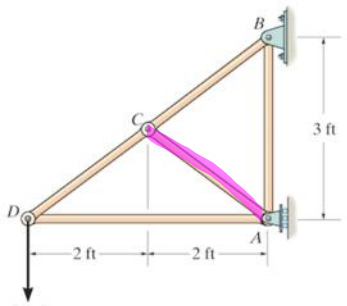
Zero-force members (ZFM)

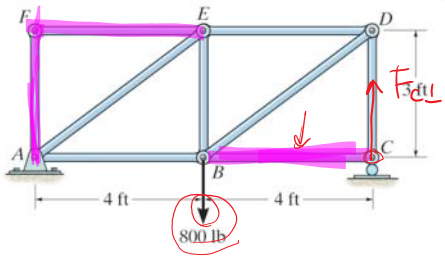
- Particular members in a structure may experience no force for certain loads.
- Zero-force members are used to increase stability.
- Identifying members with zero-force can expedite analysis.
- Requirement: No external force/support reaction on the pin for analysis.
- Two cases (use pin analysis):

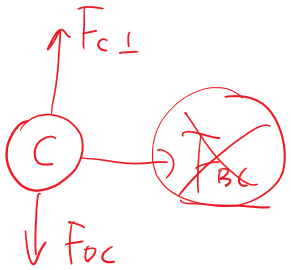
1. Two non-collinear members.
2. Two collinear members + a third non-collinear member.



Which are zero-force members?

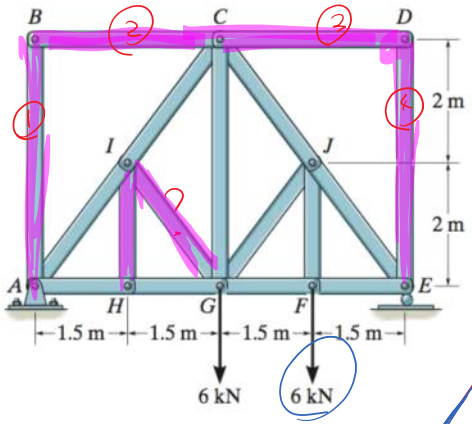




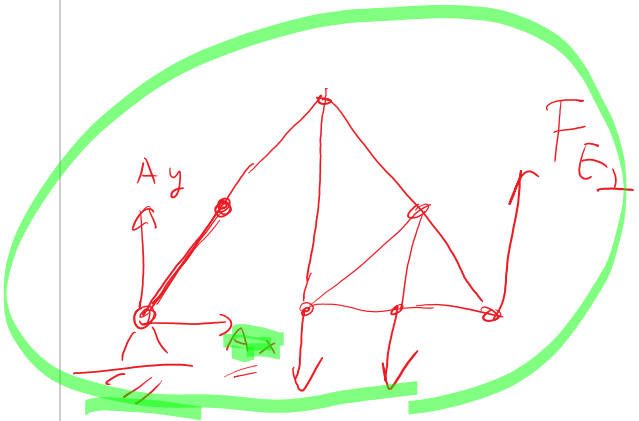


based on — —

How many zero-force members are in the truss?



A: 3
B: 4
C
D: 6
E: 7



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