
Week 8



TAM 210/211 Introduction of Statics

DISCUSSION SESSION



WEEK 8 – Truss Analysis

- **Truss**

- An assembly of long, slender members connected at joints to form a rigid structure
- Its function is to transmit loads to the supports

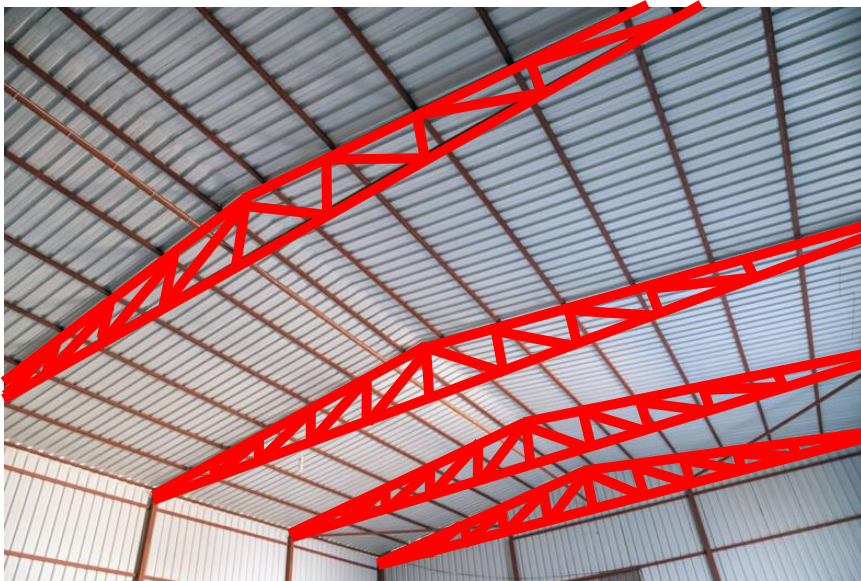
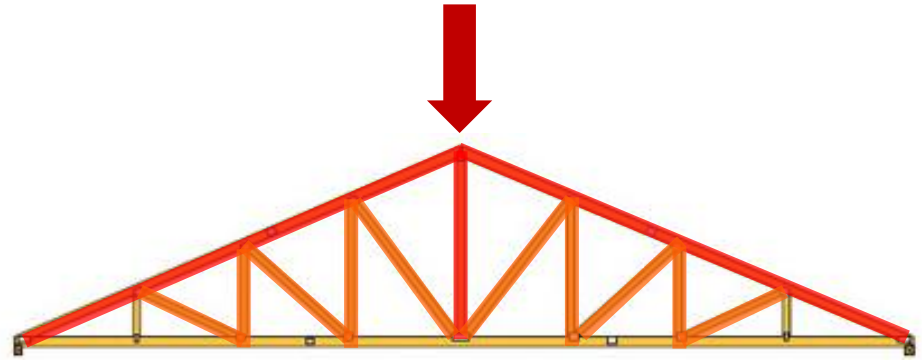


image source: (<https://roimetalbuildings.com/parts-of-a-roof-truss/>)



source: (<http://design.medeek.com/support/trusspluginmanual/commontruss.html>)

- **Truss assumptions**

- All loads are applied at the joints
- The joints are frictionless
- The weight of the members is negligible

WEEK 8 – Truss Analysis

- **Force in a truss member**

- Internal force
- Acts along the axis of the member
- Two-force member

**** direction & sign convention ****



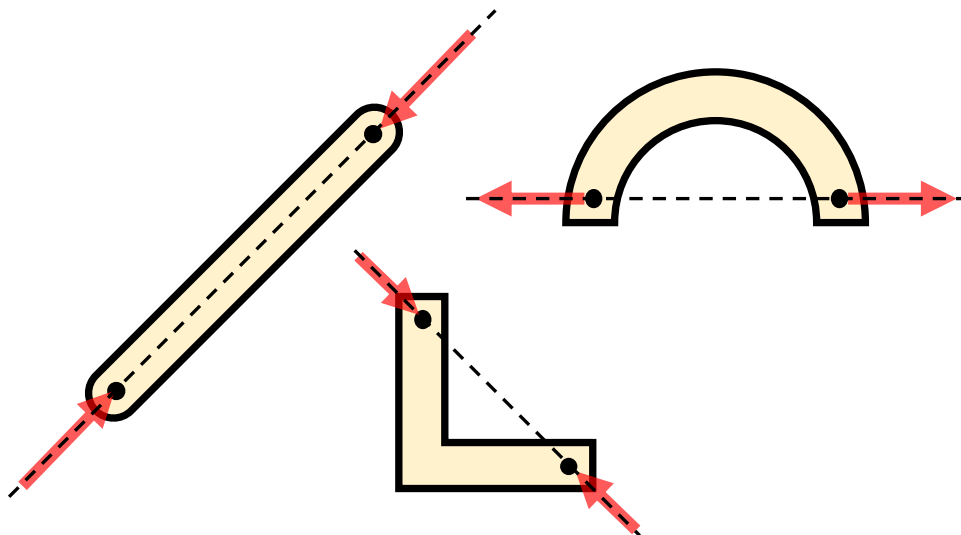
tension (+)



compression (-)

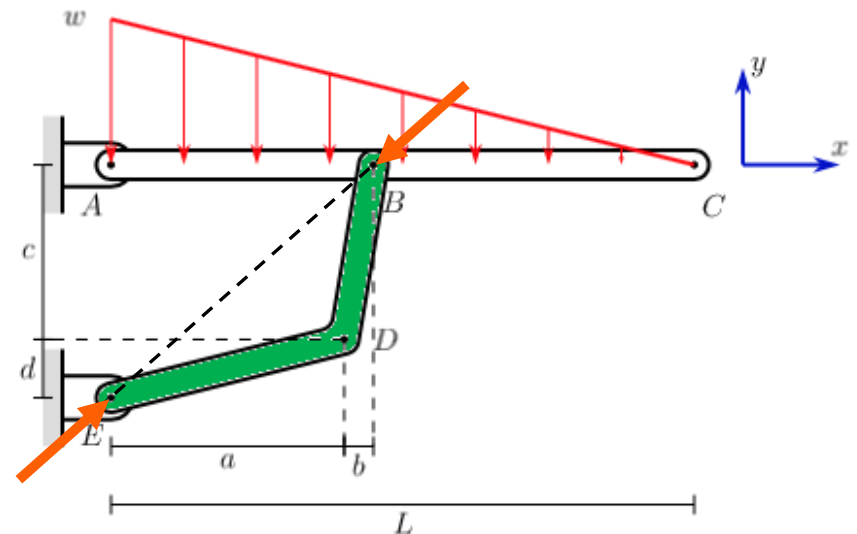
- **Two-force member**

- A rigid body with two forces acting at two points (no loads between the points, no moments)
- The forces act along the line connecting the two points



examples of two force member

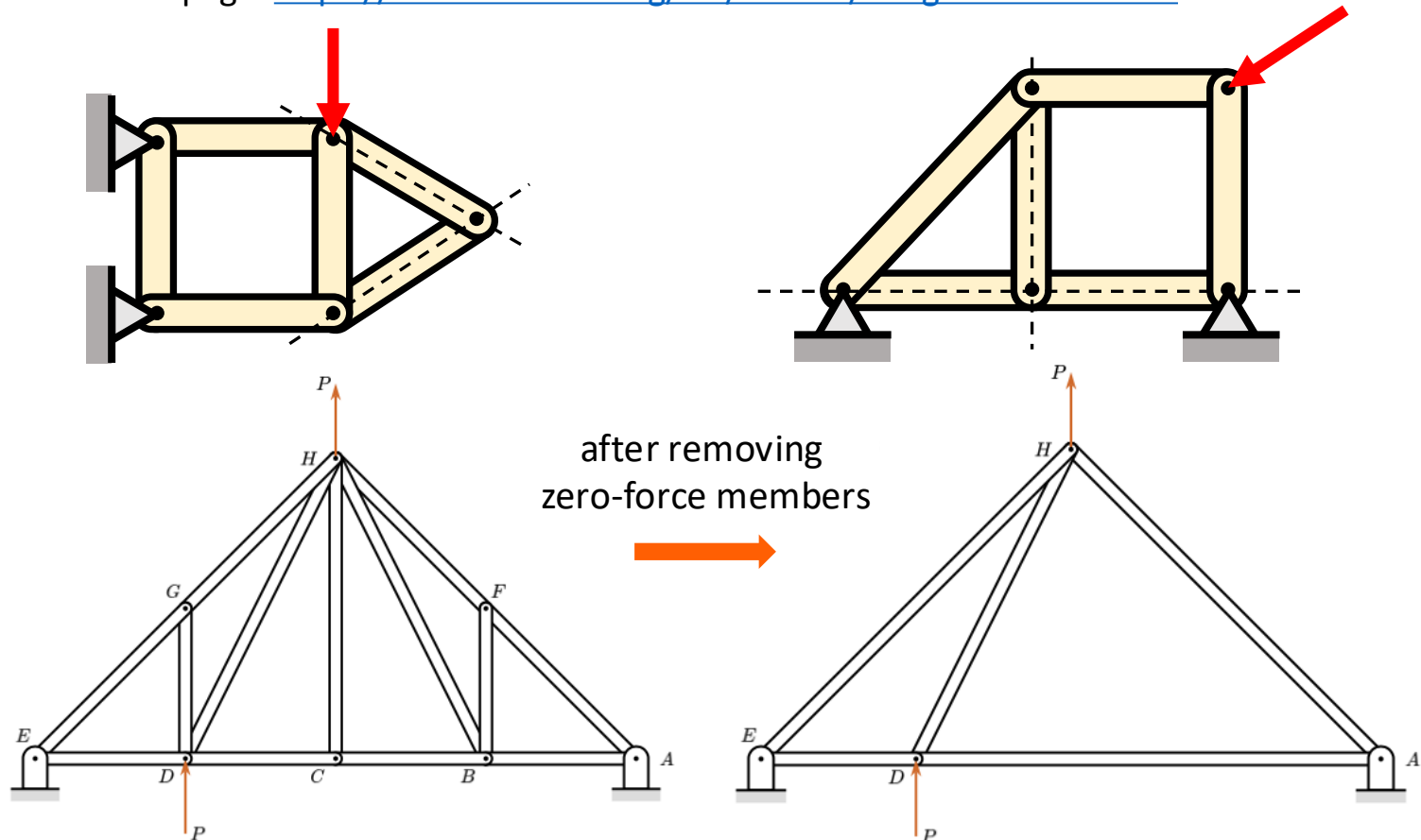
Homework 3B



WEEK 8 – Truss Analysis

- **Zero-force member**

- Members in a truss structure that experience no internal force
- Do not carry load (redundant), but improve structural stability
- Reference page: <https://www.mechref.org/sta/trusses/?origin=coursemenu>

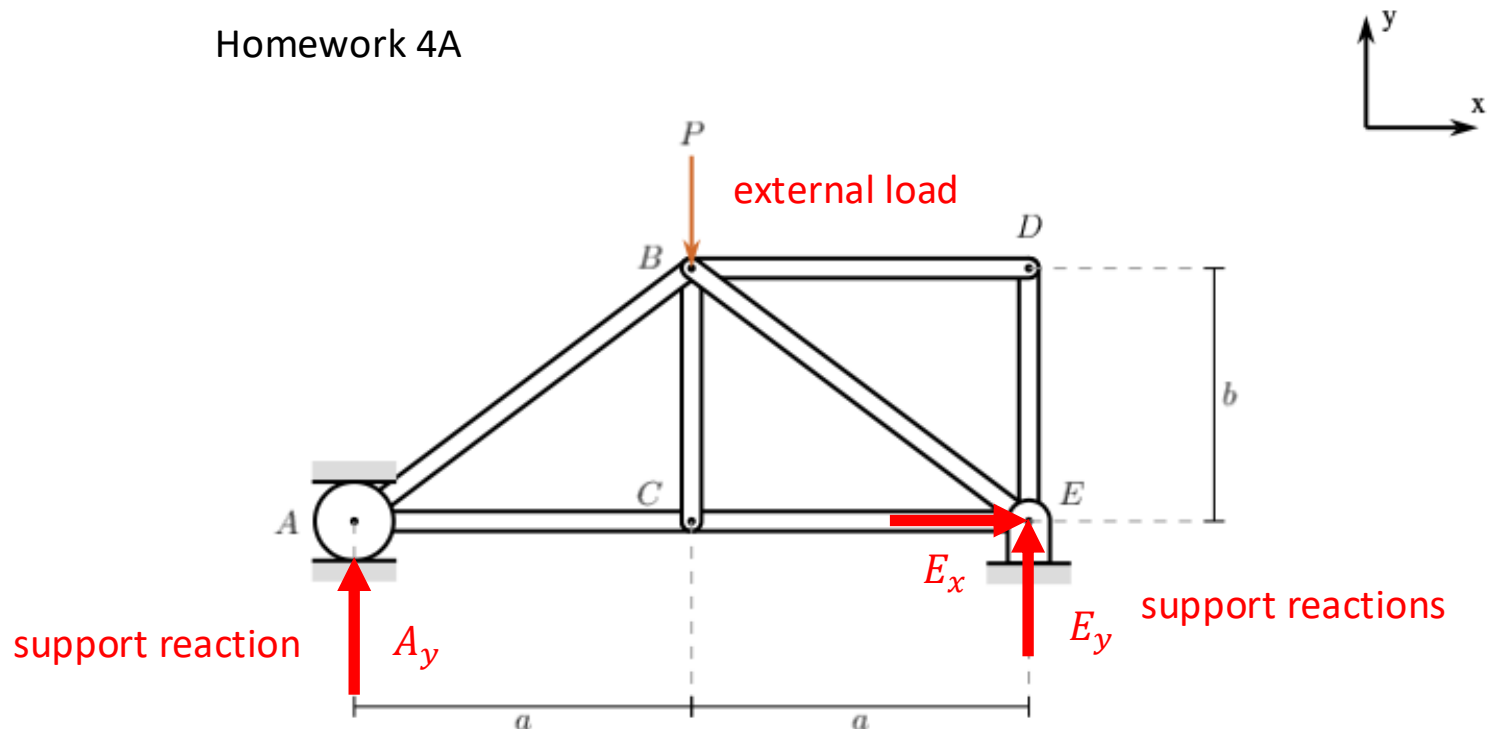


WEEK 8 – Truss Analysis

- **Method of joints**

1. Draw a free body diagram for **the entire truss** and solve for **the external reaction forces and moments** at the supports
2. Draw a free body diagram of **a joint** with at least 1 known force and at most 2 unknown forces
3. Apply the equations of equilibrium to the joint to solve for the unknown forces
4. Repeat Steps 2 and 3 to determine the forces in the truss members of interest

Homework 4A

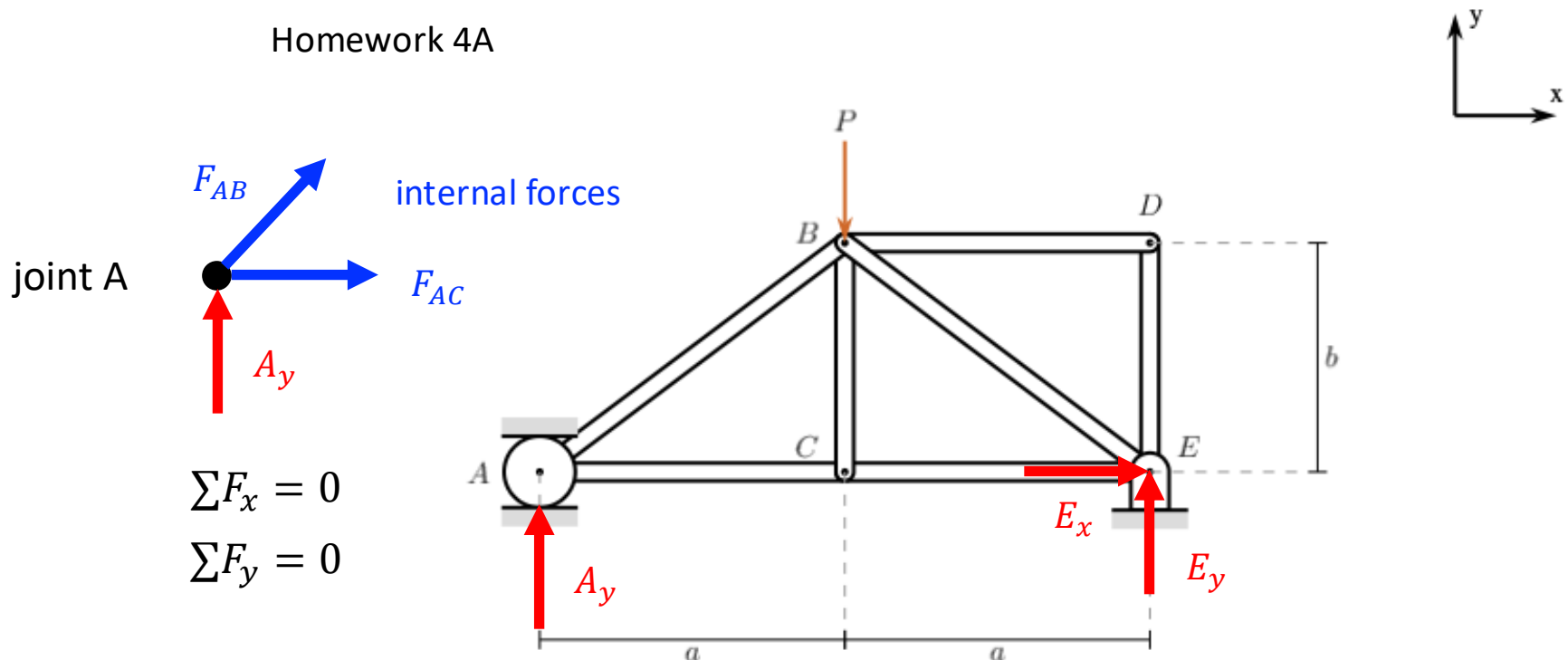


WEEK 8 – Truss Analysis

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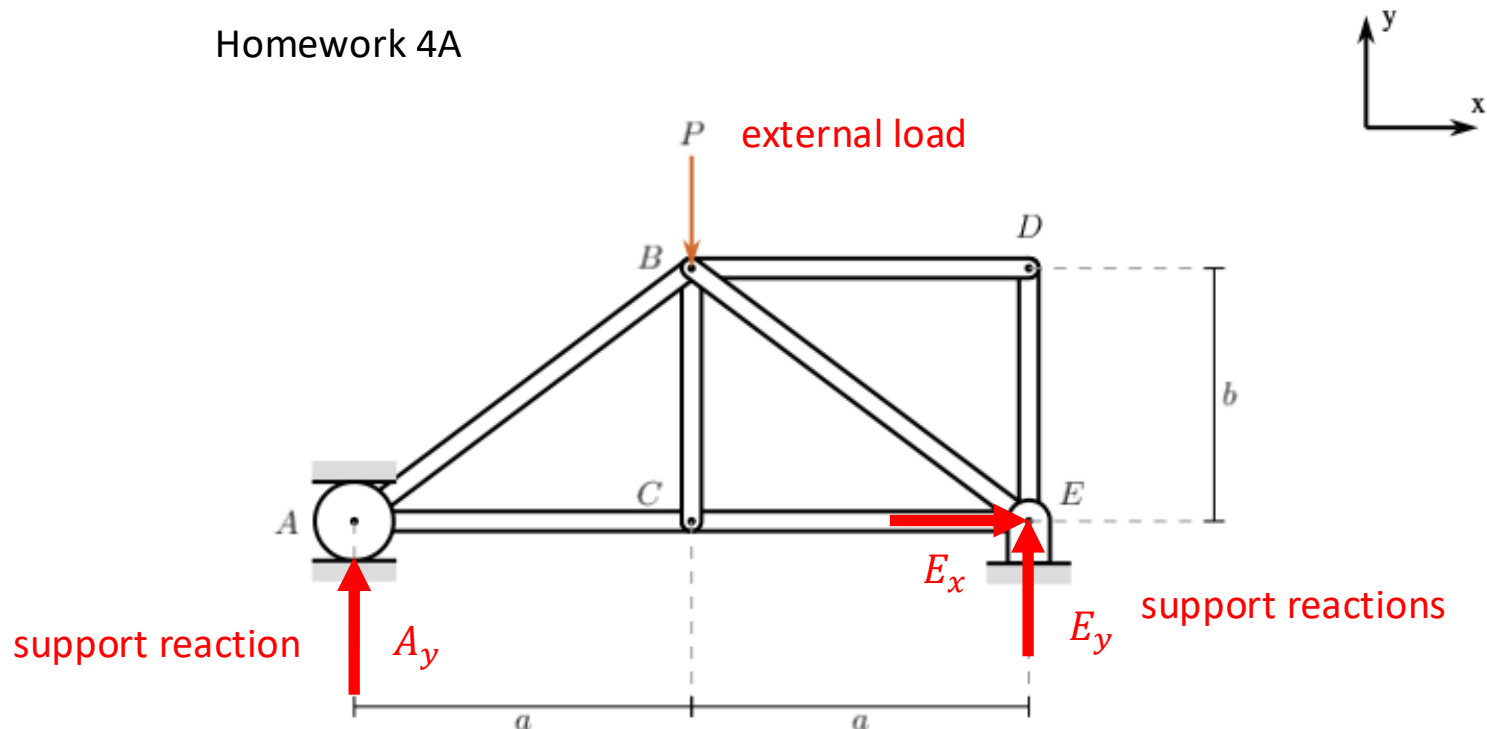


WEEK 8 – Truss Analysis

- **Method of sections**

1. Draw a free body diagram for **the entire truss** and solve for **the external reaction forces and moments** at the supports
2. Cut the truss through the members of interest and draw a free body diagram of **a section**
3. Apply the equations of equilibrium to the section to solve for the unknown forces
4. Repeat Steps 2 and 3 to determine the forces in the truss members of interest

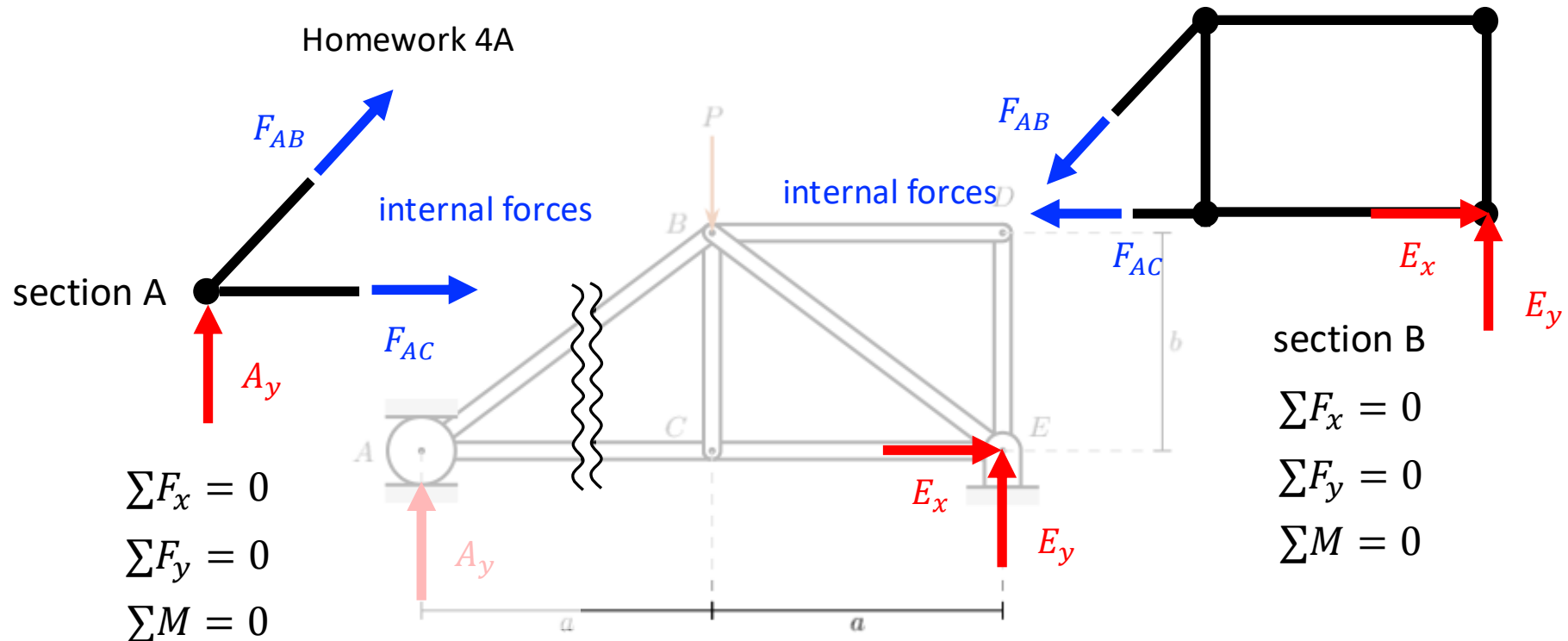
Homework 4A



WEEK 8 – Truss Analysis

- **Method of sections**

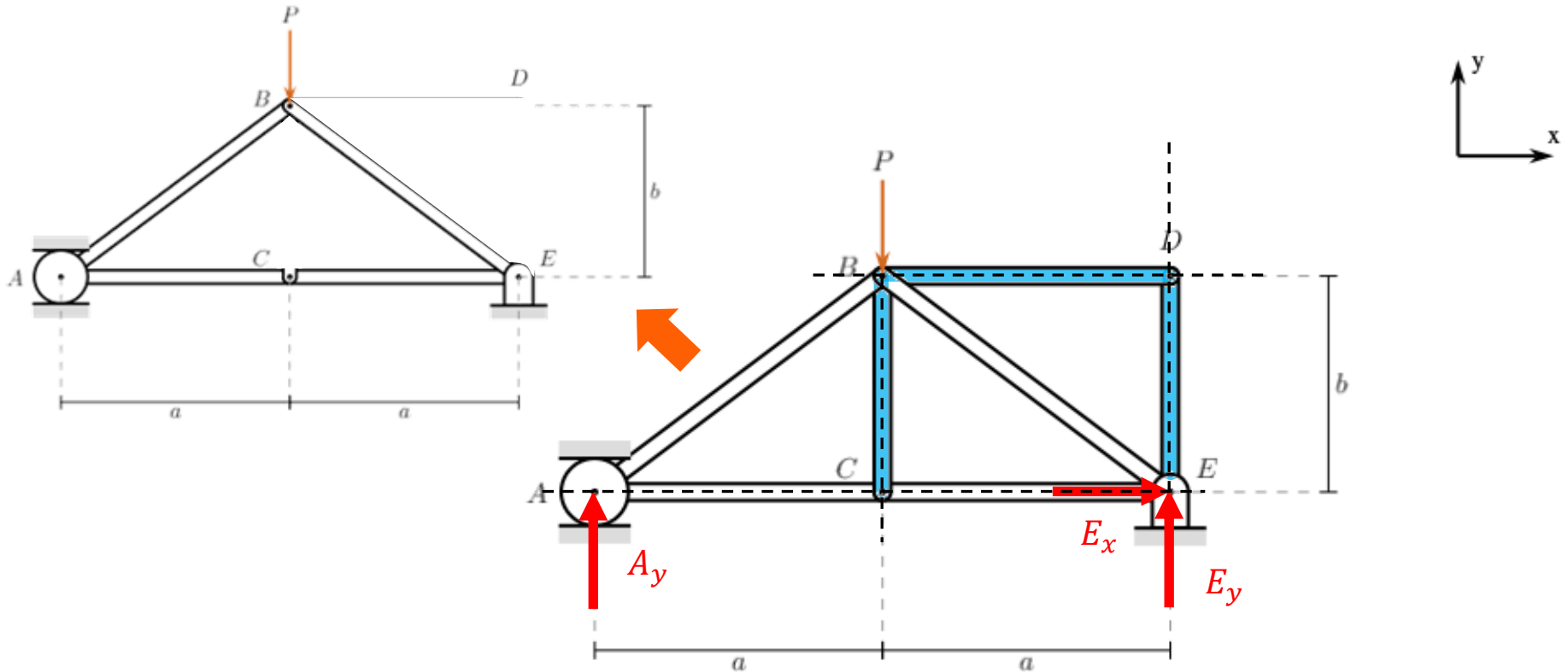
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WEEK 8 – Truss Analysis

- **Before using either methods...**

1. Remove zero-force members to simplify the truss structure
 - Two noncolinear members that share a pin with no support or external forces
 - Two colinear members + one noncolinear member with no support or external forces → the noncolinear member is zero-force member



WEEK 8 – Truss Analysis

- Truss demo



red bar → tension



blue bar → compression

- Pin support → fix to a pegboard using a bolt and nut
- Roller support → mount acrylic plates on the pegboard with a gap, and insert a bolt with a round acrylic disk into the gap to allow rolling motion