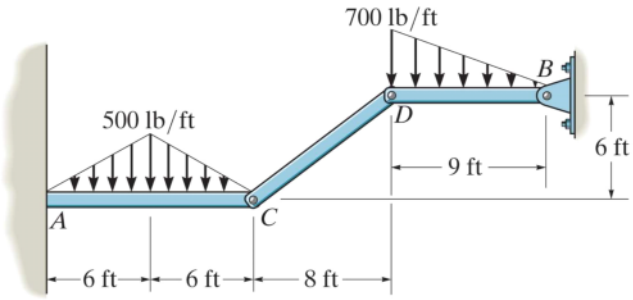
Lecture 19

Friday, October 13, 2017 12:05

To do ...

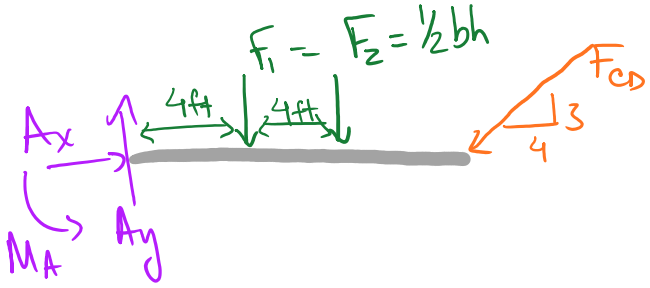
- CBTF Quiz 4 next week (Tues-Fri)
- WA 2 due **TODAY**
  - **Read instructions!!**
- HW 14 PL due **WED**
- HW 15 ME due **Thurs**



Determine the reactions at supports A and B.

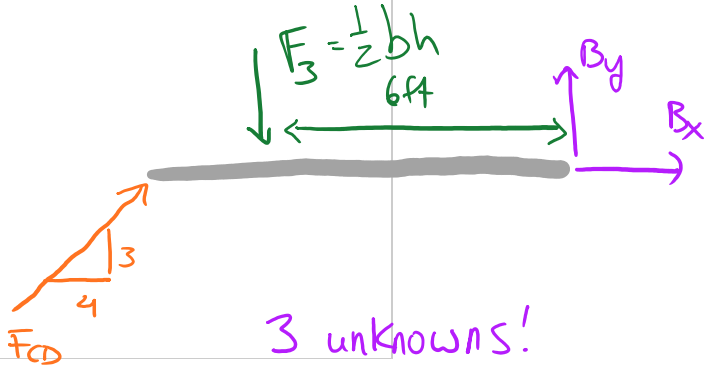
- identify 2 force members
- DRAW FBD
- How many unknowns? 5 reactions

FBD of member AC



4 unknowns!

FBD of member DB



3 unknowns!

Solve for member DB first, then for member AB.

$\Sigma M_B = 0$

$$F_3(6) - \frac{3}{5}F_{CD} = 0$$

$$F_{CD} = \frac{5}{3}(6)(F_3) = \boxed{3.5 \text{ kip}}$$

$\Sigma F_x = 0$

$$B_x + \frac{4}{5}F_{CD} = 0$$

$$B_x = -\frac{4}{5}F_{CD} = \boxed{-2.8 \text{ kip}}$$

$\Sigma F_y = 0$ $\quad B_y + \frac{3}{5}F_{CD} - F_3 = 0$

$B_y = F_3 - \frac{3}{5}F_{CD} =$ **1.05 kip**

now solve for member AB:

$\Sigma F_x = 0$ $\quad A_x - \frac{4}{5}F_{CD} = 0$

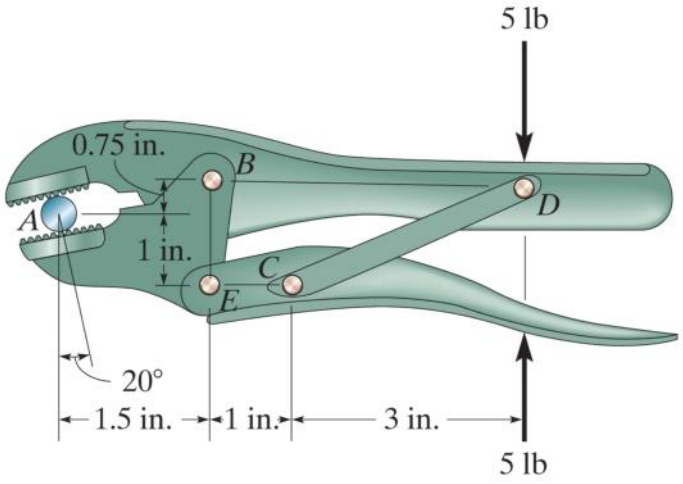
$A_x = \frac{4}{5}F_{CD} =$ **2.8 kip**

$\Sigma F_y = 0$ $\quad A_y - F_1 - F_2 - \frac{3}{5}F_{CD} = 0$

$A_y = F_1 + F_2 + \frac{3}{5}F_{CD} =$ **5.1 kip**

$\Sigma M_A = 0$ $\quad M_A - F_1(4) - F_2(8) - F_{CD}\left(\frac{3}{5}\right)(12) = 0$

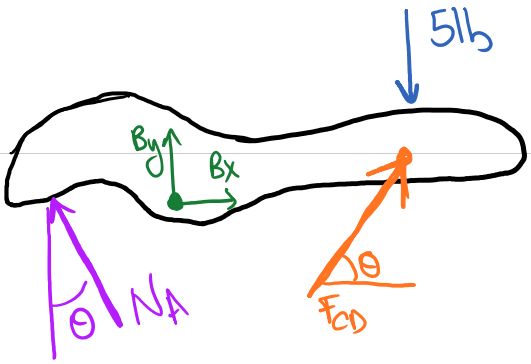
$M_A =$ **43.2 ft · kip**



A 5 lb force is applied to the handles. Determine the compressive force developed at the smooth bolt shank A at the jaws.

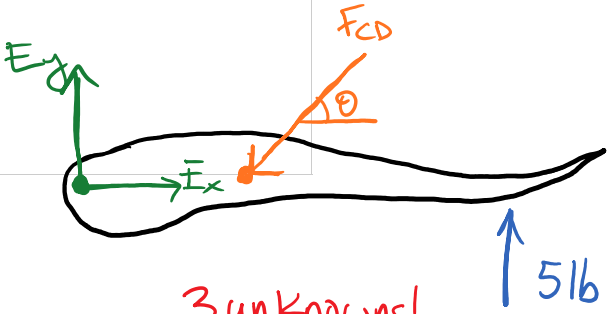
- identify 2-force members
- DRAW FBD
- How many unknowns?

FBD of member BD



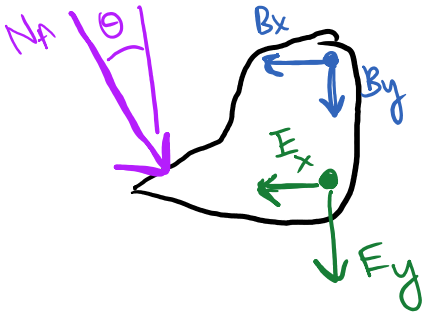
4 unknowns!

FBD of member EC



3 unknowns!

FBD of member BE



5 unknowns!

Solve for forces on member EC first, then decide

to use member BE or BD

for member EC:

$\Sigma M_E = 0$

$$5(4) - F_{CD}\sin\theta\,(1) = 0$$

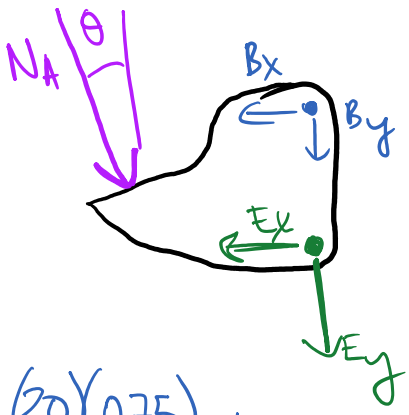
$$F_{CD} = 39.693 \text{ lb}$$

$\Sigma F_x = 0$

$$E_x - F_{CD}\cos\theta = 0$$

$$E_x = 34.286 \text{ lb}$$

now use member BE:



$\Sigma M_B = 0$

$$-E_x(1.75) + N_A\sin(20)(0.75) + N_A\cos(20)(1.5) = 0$$

$$N_A = 36 \text{ lb } !!$$