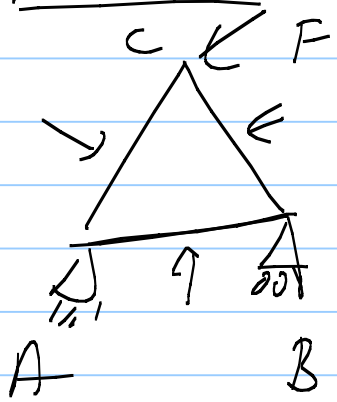
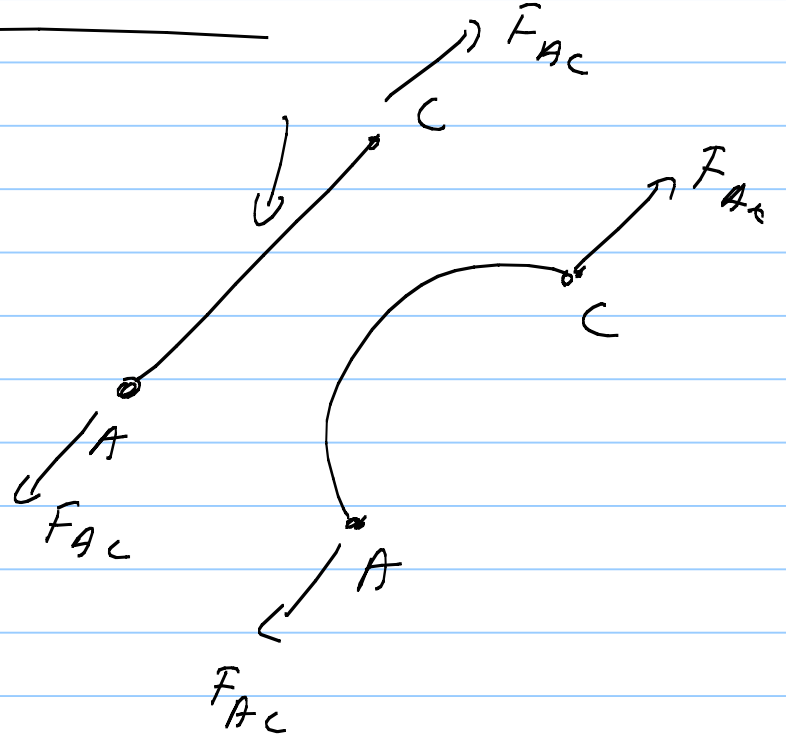
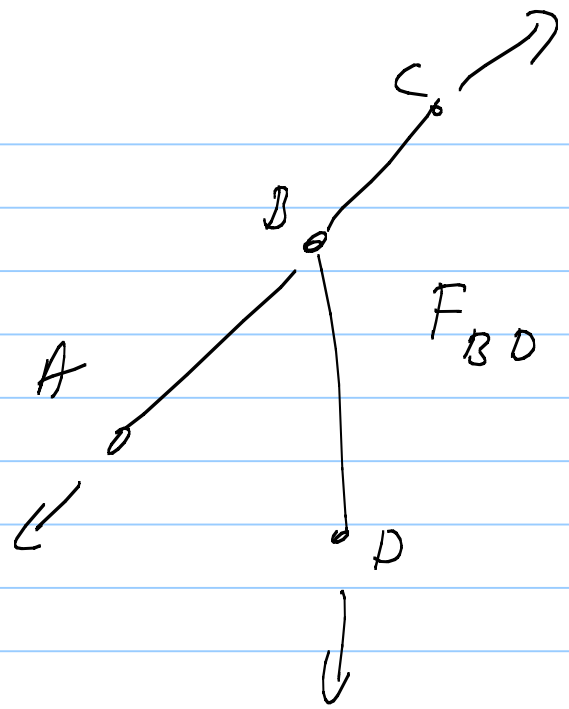
EGR 180 7/6

Note Title 7/6/2009

Frames & Trusses



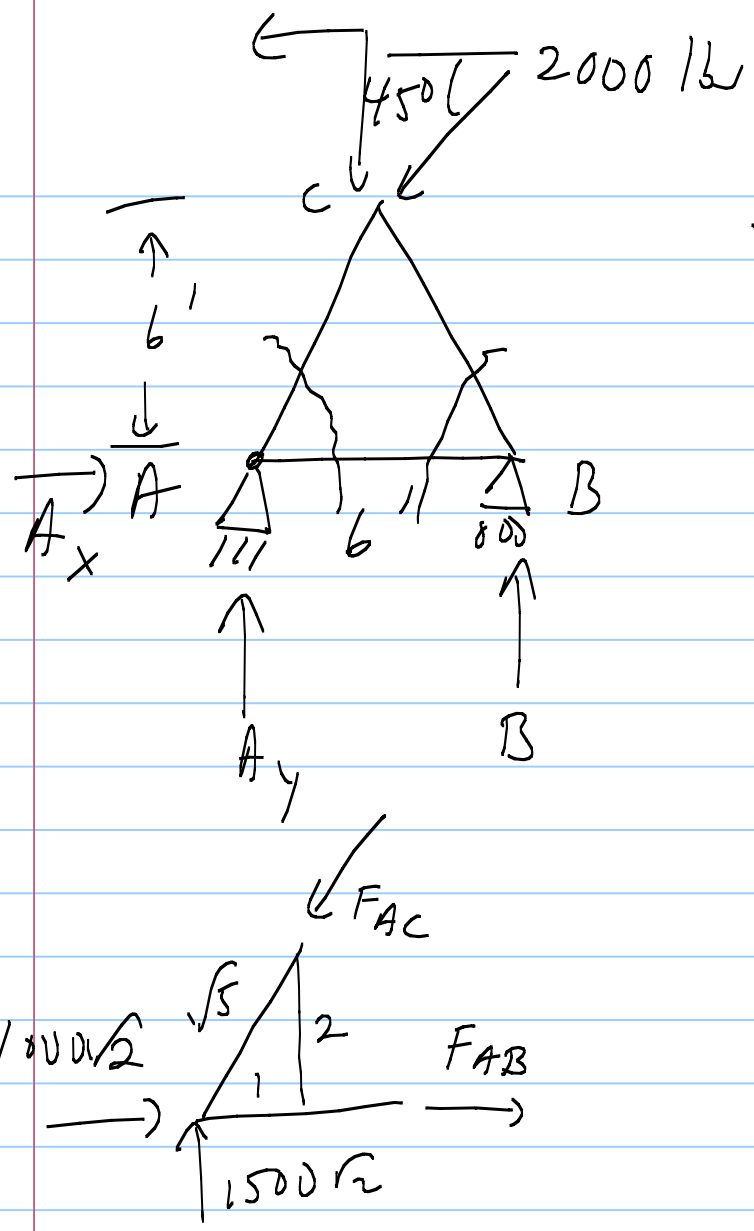




Zero member

$F_{BD} = 0$

Method of Joints Method of Sections



$$\sum M_A = 6B - 3 \cdot 1000\sqrt{2} + 6 \cdot 1000\sqrt{2} = 0$$

$$6B = -3000\sqrt{2}$$

$$B = -500\sqrt{2} \text{ lb}$$

$$\sum F_y = -500\sqrt{2} - 1000\sqrt{2} + A_y = 0$$

$$A_y = 1500\sqrt{2} \text{ lb}$$

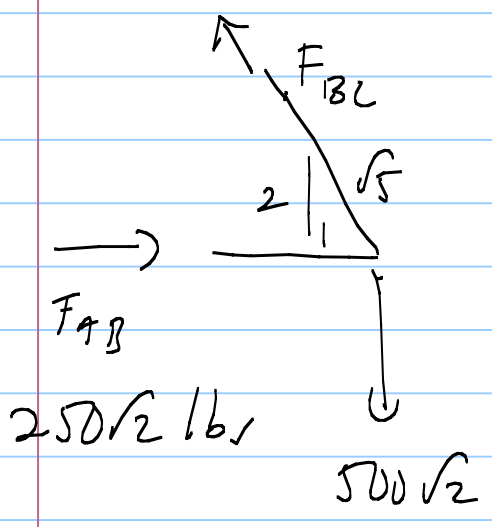
$$\sum F_x = A_x - 1000\sqrt{2} = 0$$

$$A_x = 1000\sqrt{2} \text{ lb}$$

$$\sum F_y = 1500\sqrt{2} - F_{BC}\frac{2}{\sqrt{5}} = 0 \qquad \sum F_x = 1000\sqrt{2} - \frac{1}{\sqrt{5}}750\sqrt{10} + F_{AB} = 0$$

$$F_{AC} = 750\sqrt{10} \text{ lbs}$$

$$F_{AB} = -250\sqrt{2} \text{ lbs}$$



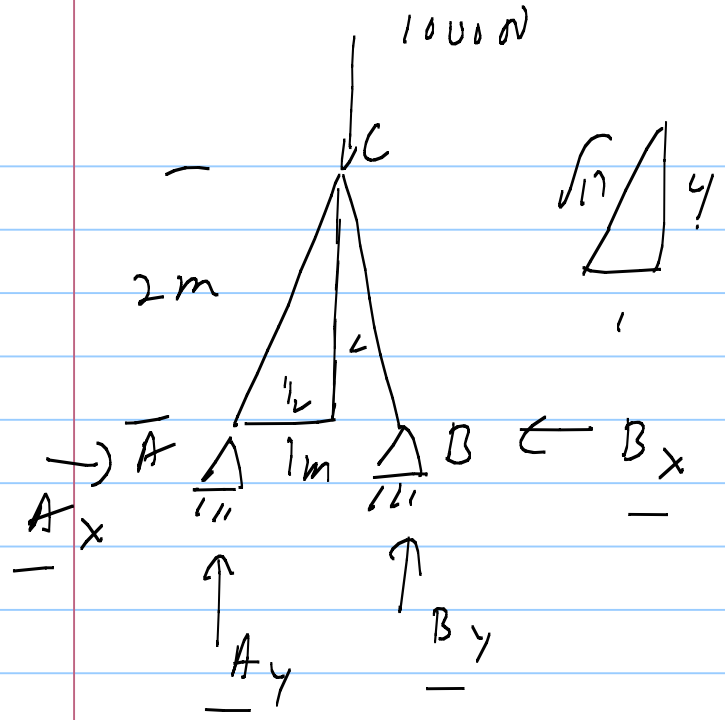
$$\sum F_y = \frac{2}{\sqrt{5}}F_{BC} - 500\sqrt{2} = 0$$

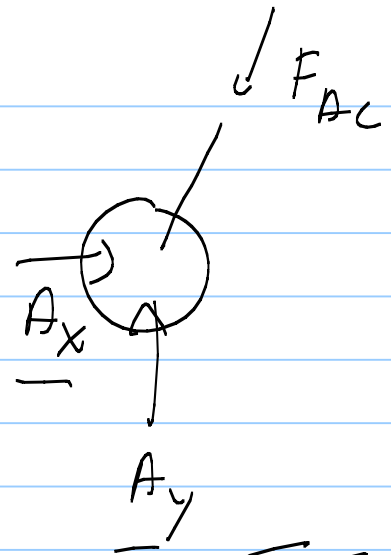
$$F_{BC} = 250\sqrt{10} \text{ lbs}$$

$F_{AC} = 2372$ lbs Comp.

$F_{BC} = 791$ lbs tension

$F_{AB} = 354$ lbs Comp





$$\frac{A_x}{A_y} = \frac{1}{4}$$

$$A_x = \frac{1}{4} A_y$$

$$\sum F_y = 500 - F_{AC} \frac{4}{\sqrt{17}} = 0$$

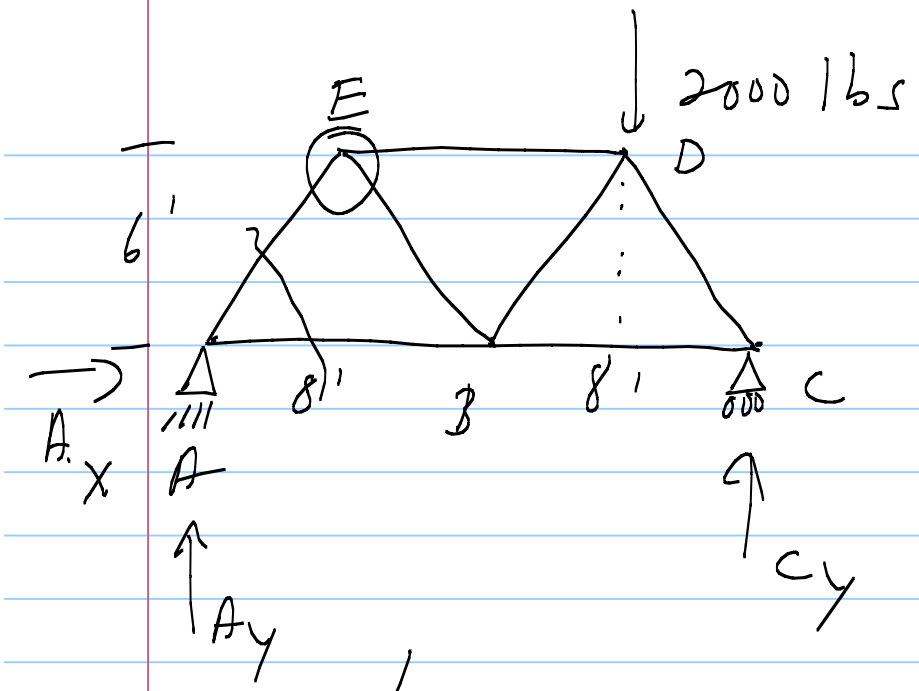
$$\sum M_A = 1 \cdot B_y - \frac{1}{2} \cdot 1000 = 0 \Rightarrow B_y = 500\ N$$

$$\sum F_y = A_y - 1000 + 500 = 0 \Rightarrow A_y = 500\ N$$

$$A_x = B_x = 125\ N$$

$$F_{AC} = 125\sqrt{17}\ N = F_{BC}$$

$$= 515\ N$$



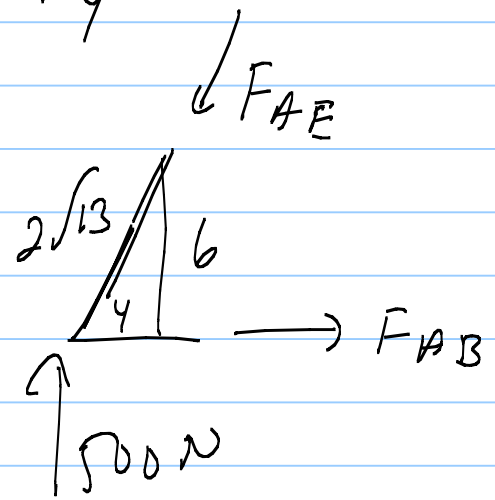
$$\sum F_x = 0 = A_x$$

$$\sum M_A = 16 C_y - 12 \cdot 2000 = 0$$

$$C_y = 1500 \text{ lbs}$$

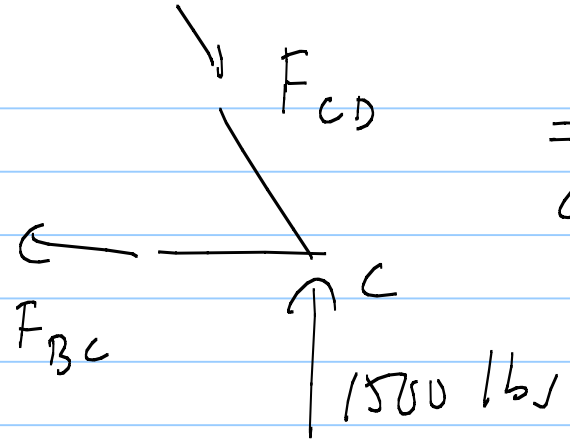
$$\sum F_y = A_y - 2000 + 1500 = 0$$

$$A_y = 500 \text{ lbs}$$



$$\sum F_y = 500 - \frac{3}{\sqrt{13}} F_{AE} = 0 \quad F_{AE} = \frac{500\sqrt{13}}{3} \text{ lbs}$$

$$\sum F_x = F_{AB} - \frac{2}{\sqrt{13}} F_{AE} = 0 \quad F_{AB} = \frac{1000}{3} \text{ lbs}$$

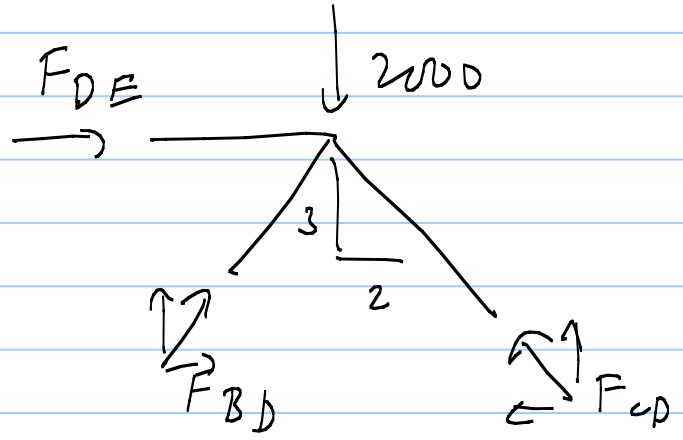


$$\sum F_y = 1500 - \frac{3}{\sqrt{13}} F_{CD} = 0$$

$$F_{CD} = 500\sqrt{13} \text{ lbs}$$

$$\sum F_x = -F_{BC} + F_{CD}\frac{2}{\sqrt{13}} = 0$$

$$F_{BC} = 1000 \text{ lbs}.$$



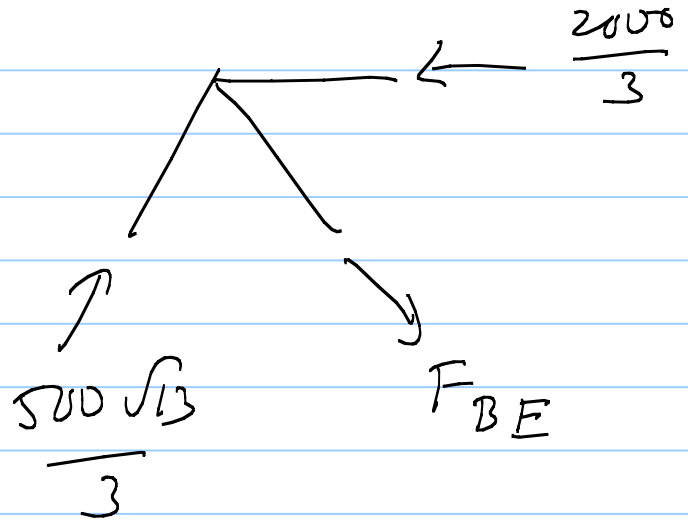
$$\sum F_y = \frac{3}{\sqrt{13}} F_{CD} + \frac{3}{\sqrt{13}} F_{BD} - 2000 = 0$$

$$\frac{3}{\sqrt{13}} F_{BD} = 500$$

$$F_{BD} = \frac{500\sqrt{13}}{3}$$

$$\sum F_x = F_{DE} + F_{BD}\cdot\frac{2}{\sqrt{13}} - F_{CD}\cdot\frac{2}{\sqrt{13}} = 0$$

$$F_{DE} = 1000 - \frac{1000}{3} = \frac{2000}{3} \text{ lbs}$$

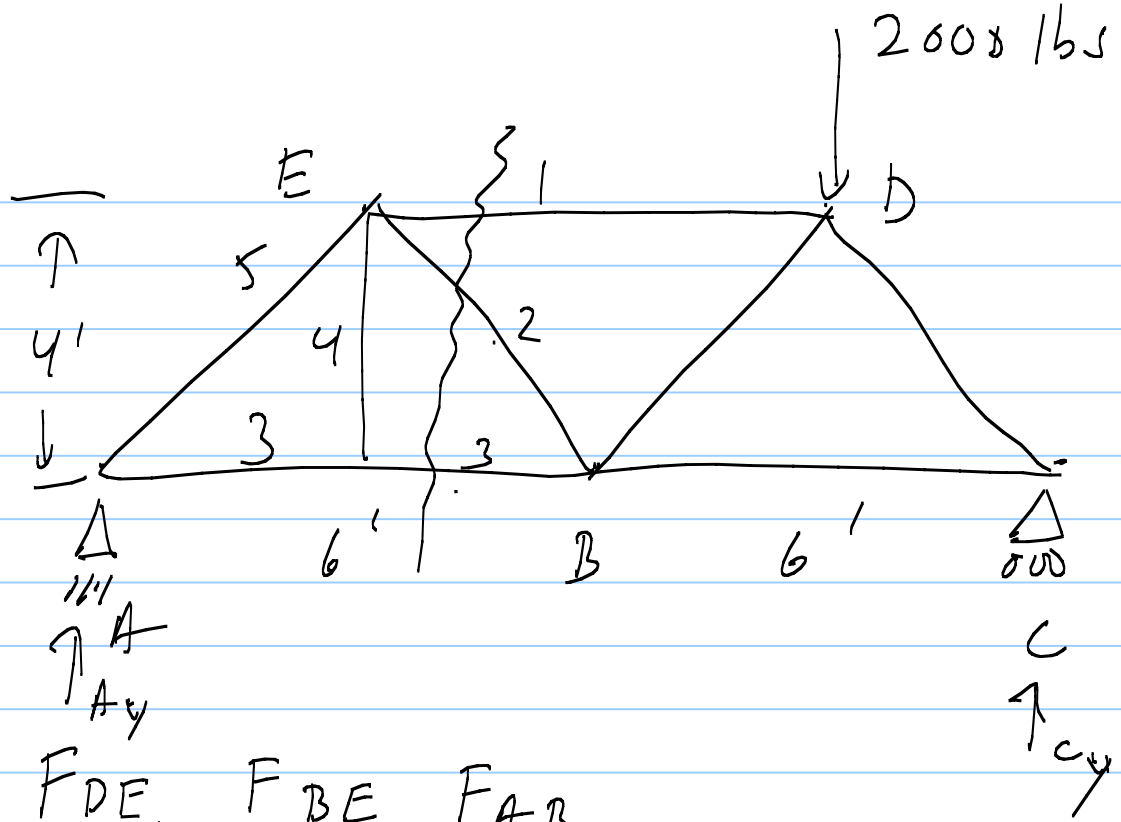


$$\sum F_y = \frac{500\sqrt{3}}{3}\cdot\frac{3}{\sqrt{3}} - F_{BE}\cdot\frac{3}{\sqrt{3}} = 0$$

$$F_{BE} = \frac{500\sqrt{3}}{3}\ \text{lbs}$$

$$\sum F_x = \frac{500\sqrt{3}}{3}\cdot\frac{2}{\sqrt{3}} + \frac{500\sqrt{3}}{3}\cdot\frac{2}{\sqrt{3}} - \frac{2000}{3} = 0$$

$$= \frac{1000}{3} + \frac{1000}{3} - \frac{2000}{3} = 0 \checkmark$$

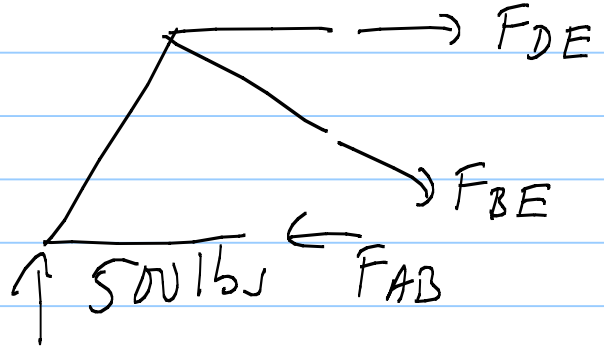


$\sum M_A = -4 \cdot 2000 + 12 \cdot C_y = 0$

$C_y = 1500$ lbs

$A_y = 500$ lbs

F_{DE}, F_{BE}, F_{AB}



$\sum M_E = -3 \cdot 500 - 4 F_{AB} = 0$

$F_{AB} = -375$ lbs

$$\sum M_B = -6 \cdot 500 - 4 \cdot F_{DE} = 0 \quad F_{DE} = -750 \text{ lbs}$$

$$\sum F_y = 500 - .8\, F_{BE} = 0 \Rightarrow F_{BE} = 625 \text{ lbs}$$