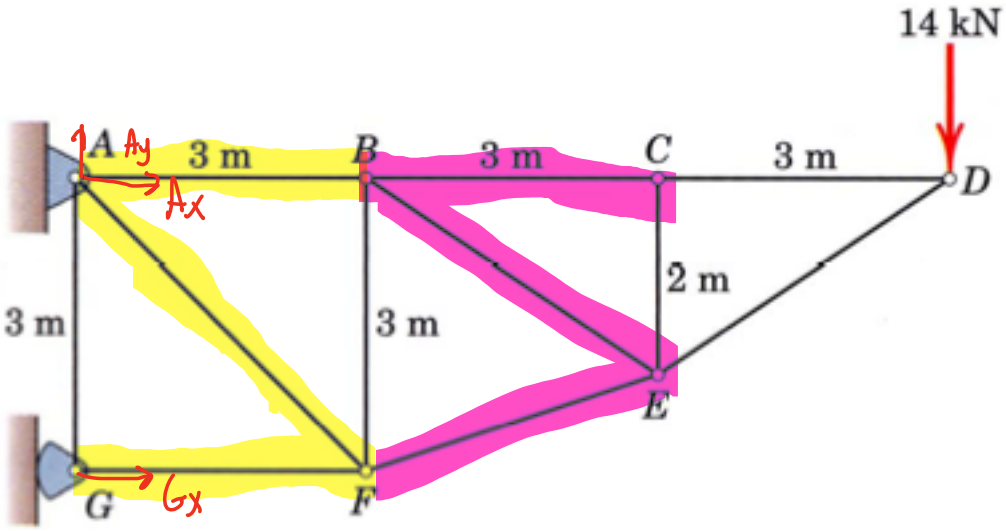
Problem 2

Tuesday, February 26, 2019 9:49 PM



$\Sigma F_y = 0$: $A_y - 14 = 0 \Rightarrow \boxed{A_y = 14\,kN}$ ↑

$\Sigma F_x = 0$: $A_x + G_x = 0 \Rightarrow A_x = -G_x$

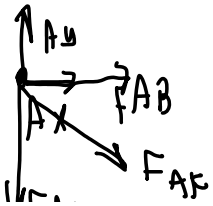
$\Sigma M_G = 0$: $-A_x \cdot 3 - 14 \cdot 9 = 0$

$\boxed{A_x = -14 \cdot 3\,kN = -42\,kN}$ ←

$\boxed{G_x = 42\,kN}$ →

joint A

$\tan(1) = 45°$



F_{AC} is a 0 force member

$\therefore \Sigma F_y = 0 \Rightarrow A_y - F_{AF}\sin(45) = 0$

VFAG

$A_y = F_{AF}\sin 45$

$14 = F_{AF}\sin 45$

$F_{AF} = 19.80\,kN$ (tensile) ↘

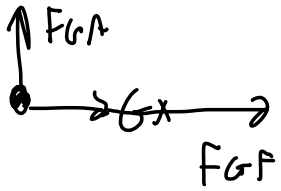
$\sum f_x = 0$:

$F_{AF}(\cos 45) + F_{AB} + A_x = 0$

$19.80\cos 45 + F_{AB} - 42 = 0$

$F_{AB} = 28\,kN$ → tensile

joint G



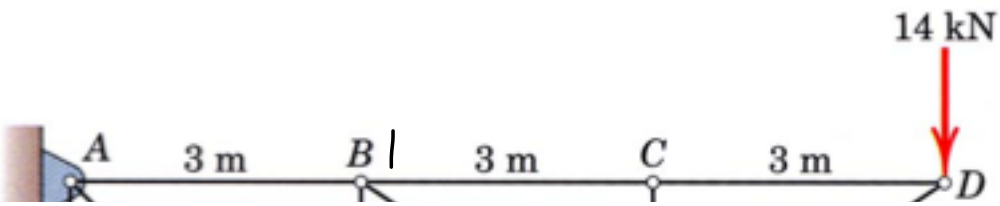
$\sum f_x = 0$: $G_x + F_{GF} = 0$

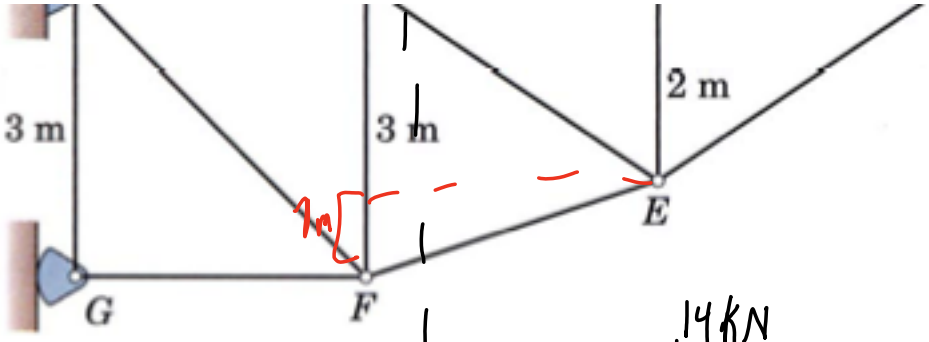
$G_x = -F_{GF}$

$42 = -F_{GF}$

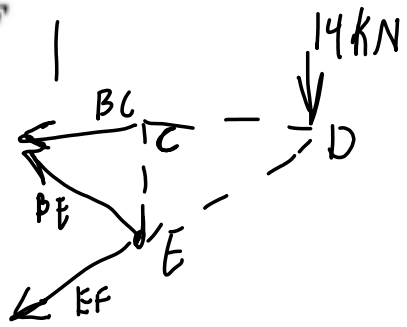
$F_{GF} = 42\,kN$ ← compressive

BC, BE, EF





Sectional



$\sum M_E = 0: (2)BC - 14(3) = 0 \Rightarrow BC = \frac{42\,kN}{2} = 21\,kN$ (tensile)

$\sum M_B = 0: \; -EF_x \cdot 3 - 14 \cdot 6 = 0$

$-EF\cos(18.43) \cdot 3 = 14 \cdot 6$

$EF = -29.51\,kN$

$EF = 29.51\,kN$ (compressive)

$\sum F_y = 0: \; -14 + BE\left(\frac{2}{\sqrt{13}}\right) - EF\left(\frac{1}{\sqrt{10}}\right) = 0$

$BE = \left(14 - 29.51\left(\frac{1}{\sqrt{10}}\right)\right) \cdot \left(\frac{\sqrt{13}}{2}\right)$

$BE = 8.42\,kN$ tensile ↑