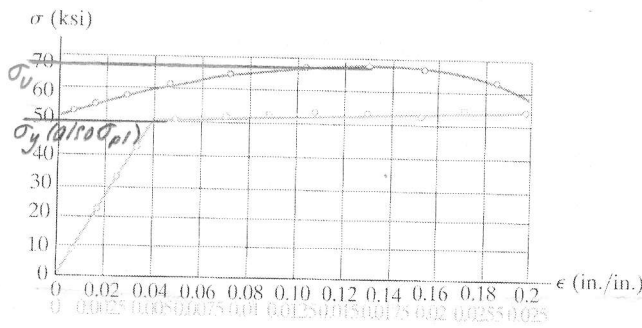


3-10



Probs. 3-10/11/12

$$E = \frac{\sigma_{pl}}{\epsilon_{pl}} = \frac{50 \text{ ksi}}{0.005 \frac{\text{in.}}{\text{in.}}} = 10,000 \text{ ksi}$$

← from lower scale

$$\sigma_y = 50 \text{ ksi} = \frac{P_y}{A}$$

$$P_y = (50 \text{ ksi}) \left( \frac{\pi}{4} (0.5 \text{ in.})^2 \right)$$

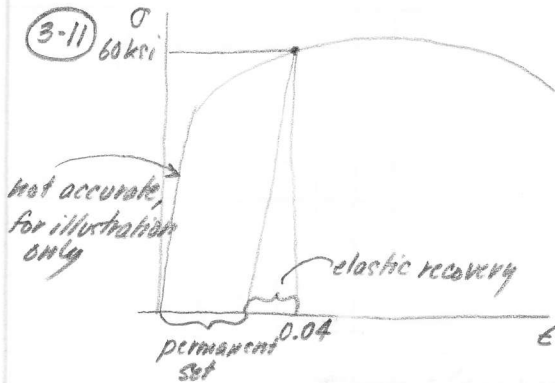
$$= 9.82 \text{ kip}$$

$$\sigma_u = 68 \text{ ksi} = \frac{P_u}{A}$$

$$P_u = (68 \text{ ksi}) \left( \frac{\pi}{4} (0.5 \text{ in.})^2 \right)$$

$$= 13.4 \text{ kip}$$

3-11



elastic recovery: from 3-10  $E = 10,000 \text{ ksi}$

$$\epsilon_{\text{elastic recovery}} = \frac{\sigma}{E} = \frac{60 \text{ ksi}}{10,000 \text{ ksi}} = 0.006 \frac{\text{in.}}{\text{in.}}$$

$$\delta_{\text{elastic recovery}} = (2 \text{ in.}) (0.006 \frac{\text{in.}}{\text{in.}}) = 0.012 \text{ in.}$$

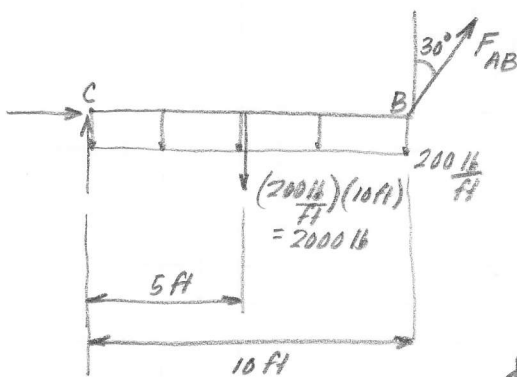
gage length = original + permanent after unloading gage length set

$$\epsilon_{\text{perm. set}} = 0.04 \frac{\text{in.}}{\text{in.}} - 0.006 \frac{\text{in.}}{\text{in.}} = 0.034 \frac{\text{in.}}{\text{in.}}$$

$$\delta_{\text{perm. set}} = (2 \text{ in.}) (0.034 \frac{\text{in.}}{\text{in.}}) = 0.068 \text{ in.}$$

$$\text{gage length after unloading} = 2 \text{ in.} + 0.068 \text{ in.} = 2.068 \text{ in.}$$

3-17



$$\sum M_C = 0, -(2,000 \text{ lb})(5 \text{ ft}) + (F_{AB} \cos 30^\circ)(10 \text{ ft}) = 0$$

$$F_{AB} = 1,154.7 \text{ lb}$$

$$\delta_{AB} = L_{AB} \epsilon_{AB} = L_{AB} \frac{\sigma_{AB}}{E_{AB}} = L_{AB} \frac{F_{AB}}{A_{AB} E_{AB}}$$

$$\delta_{AB} = (6 \text{ ft}) \left( \frac{12 \text{ in.}}{1 \text{ ft}} \right) \frac{1,154.7 \text{ lb}}{\frac{\pi}{4} (0.2 \text{ in.})^2 \cdot 29 \times 10^6 \frac{\text{lb}}{\text{in.}^2}} = 0.09125 \text{ in.}$$

from back cover of text:  
for A992 steel,  $E = 29 \times 10^6 \frac{\text{lb}}{\text{in.}^2}$