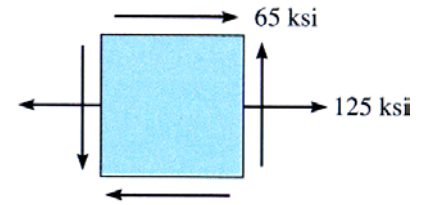
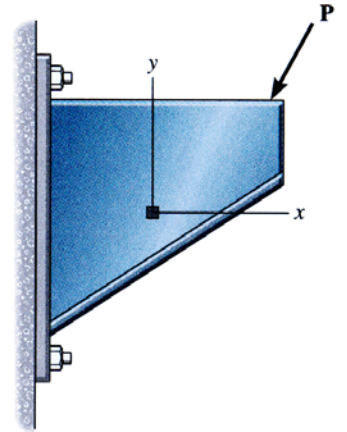


1. The state of stress at a point is shown on the element. Determine (a) the principal stresses and (b) the maximum in-plane shear stress and the average normal stress at the point. Show these answers on properly oriented elements.



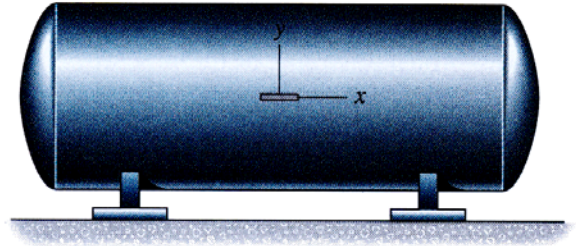
2. Due to the load P , the state of strain at the point on the bracket has components of $\epsilon_x = 500\mu$, $\epsilon_y = 350\mu$, and $\gamma_{xy} = -430\mu$. Determine the equivalent in-plane strains on an element oriented at an angle of $\theta = 30^\circ$ clockwise from the original position and show them on a properly oriented element.



3. The strain gauge is placed on the surface of a thin-walled boiler as shown. If the strain is 0.0004, determine the pressure in the boiler. The boiler has a thickness of 0.5 in. and inner diameter of 30 in. Also, determine the maximum in-plane shear stress and the absolute maximum shear stress in the material.

$$E = 28 \times 10^6 \text{ psi}$$

$$G = 10.8 \times 10^6 \text{ psi}$$



4. The solid shaft shown has a radius of 0.5 in. and is made of steel having a yield stress of $\sigma_y = 36$ ksi. Determine if the loadings cause the shaft to fail according to the maximum-shear-stress theory.

