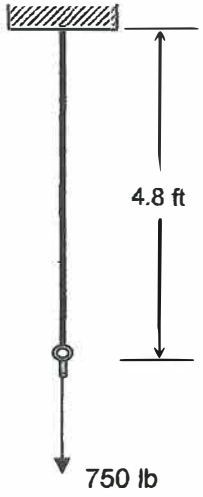
Example

A 4.8-ft-long wire is subjected to a 750-lb tensile load. If the diameter of the wire is ¼ in, find

$E = 29.\times10^6$ psi

a) the wire's elongation and,
b) the resulting normal stress.



a). $\sigma = E\epsilon$

$$\frac{P}{A} = E\frac{\delta}{L}$$

$$\delta = \frac{PL}{AE} \qquad P = \frac{PL}{\frac{\pi D^2}{4}E}$$

$$= \frac{(750\ lb)(4.8\ ft)}{\frac{\pi}{4}\left(\frac{1}{4}\right)^2\left(29\times10^6\ \frac{lb}{in^2}\right)}$$

$$= 0.00253\ ft = 0.0303\ in$$

b) $$\sigma = \frac{P}{A} = \frac{P}{\frac{\pi D^2}{4}} = \frac{(750\ lb)}{\frac{\pi(1/4)^2}{4}\ in^2}$$

$$= 15{,}280\ lb/in = 15.3\ ksi$$