53. <u>Problem 13.47E (HRW)</u>

After a fall, a 95 kg rock climber finds himself dangling from the end of a rope that had been 15 m long and 9.6 mm in diameter but which has stretched by 2.8 cm. We have to calculate for the rope (a) strain, (b) stress and (c) Young's modulus.



Stress =
$$\frac{F}{A} = \frac{931 \text{ N}}{\pi \times (4.8 \times 10^{-3})^2 \text{ m}^2} = 1.28 \times 10^7 \text{ N m}^{-2}.$$

(c)

Young's modulus, E,

$$E = \frac{\text{stress}}{\text{strain}} = \frac{1.28 \times 10^7 \text{ N m}^{-2}}{1.86 \times 10^{-3}} = 6.88 \times 10^9 \text{ N m}^{-2}.$$

