67. For a cylinder of height h, the surface area is $A_c = 2\pi rh$, and the area of a sphere is $A_o = 4\pi R^2$. The net radiative heat transfer is given by Eq. 19-40.

(a) We estimate the surface area A of the body as that of a cylinder of height 1.8 m and radius $r = 0.15$ m plus that of a sphere of radius $R = 0.10$ m. Thus, we have $A \approx A_c + A_o = 1.8$ m^2. The emissivity $\varepsilon = 0.80$ is given in the problem, and the Stefan-Boltzmann constant is found in §19-11: $\sigma = 5.67 \times 10^{-8}\,\mathrm{W/m^2\cdot K^4}$. The "environment" temperature is $T_{\text{env}} = 303$ K, and the skin temperature is $T = \frac{5}{9}(102 - 32) + 273 = 312$ K. Therefore,

$$P_{\text{net}} = \sigma\varepsilon A\left(T_{\text{env}}^4 - T^4\right) = -86 \text{ W} .$$

The corresponding sign convention is discussed in the textbook immediately after Eq. 19-40. We conclude that heat is being lost by the body at a rate of roughly 90 W.

(b) Half the body surface area is roughly $A = 1.8/2 = 0.9$ m^2. Now, with $T_{\text{env}} = 248$ K, we find

$$|P_{\text{net}}| = \left|\sigma\varepsilon A\left(T_{\text{env}}^4 - T^4\right)\right| \approx 230 \text{ W} .$$

(c) Finally, with $T_{\text{env}} = 193$ K (and still with $A = 0.9$ m^2) we obtain $|P_{\text{net}}| = 330$ W.