62. We use Eqs. 19-38 through 19-40. Note that the surface area of the sphere is given by $A = 4\pi r^2$, where $r = 0.500\,\text{m}$ is the radius.

(a) The temperature of the sphere is $T = 273.15 + 27.00 = 300.15\,\text{K}$. Thus

$$\begin{aligned} P_r &= \sigma \varepsilon A T^4 \\ &= \left(5.67 \times 10^{-8}\,\text{W/m}^2\cdot\text{K}^4\right)(0.850)(4\pi)(0.500\,\text{m})^2(300.15\,\text{K})^4 \\ &= 1.23 \times 10^3\ \text{W} \ . \end{aligned}$$

(b) Now, $T_{\text{env}} = 273.15 + 77.00 = 350.15\,\text{K}$ so

$$\begin{aligned} P_a &= \sigma \varepsilon A T_{\text{env}}^4 \\ &= \left(5.67 \times 10^{-8}\,\text{W/m}^2\cdot\text{K}^4\right)(0.850)(4\pi)(0.500\,\text{m})^2(350.15\,\text{K})^4 \\ &= 2.28 \times 10^3\ \text{W} \ . \end{aligned}$$

(c) From Eq. 19-40, we have

$$P_n = P_a - P_r = 2.28 \times 10^3\,\text{W} - 1.23 \times 10^3\,\text{W} = 1.05 \times 10^3\ \text{W} \ .$$