Problem 2.1 An AWG-14 copper wire has a resistance of 17.1 Ω at 20°C. How long is it?

Solution: AWG-14 has a diameter of 1.6 mm (Table 2-2), and at 20°C, copper's conductivity is $\sigma = 5.81 \times 10^7$ (S/m) [Table 2-1].

$$
\begin{aligned}
R &= \frac{\ell}{\sigma A} \\
\ell &= R\sigma A \\
&= R\sigma\pi(d/2)^2 \\
&= 17.1 \times 5.81 \times 10^7 \pi \times \left(\frac{1.6 \times 10^{-3}}{2}\right)^2 \simeq 2 \text{ km}.
\end{aligned}
$$