PROBLEM 2.89

KNOWN: Steady-state operating data are provided for a household refrigerator.

FIND: Determine the cost of operating the refrigerator in a month when it operates 360 hours.

SCHEMATIC & GIVEN DATA:

- $\beta = 2.4$
- $\dot{Q}_{in} = 600$ Btu/h operation for 360 h
- Value of electricity = \$0.08 per kW·h

ANALYSIS:

For a refrigeration cycle,

$$\beta = \frac{\dot{Q}_{in}}{\dot{W}_{cycle}}$$

where $\dot{Q}_{in}$ is the rate energy is removed from the refrigerated space.

Thus, $\dot{W}_{cycle} = \frac{\dot{Q}_{in}}{\beta} = \frac{600 \text{ Btu/h}}{2.4} = 250 \frac{\text{Btu}}{\text{h}}$

$$\dot{\$} = \left(250 \frac{\text{Btu}}{\text{h}}\right)\left(360 \frac{\text{h}}{\text{month}}\right)\left(\frac{\$0.08}{\text{kW·h}}\right)\left|\frac{1 \text{ kW}}{3413 \text{ Btu/h}}\right| = \$2.11/\text{month}$$