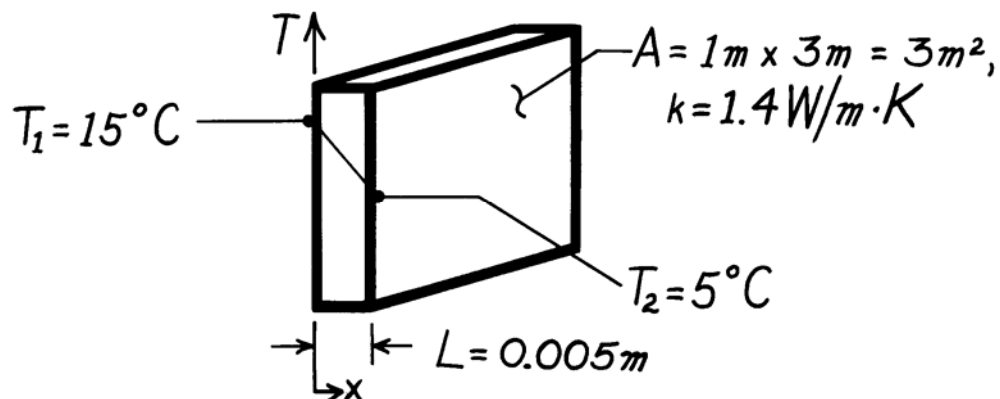# PROBLEM 1.7

KNOWN: Inner and outer surface temperatures of a glass window of prescribed dimensions.

FIND: Heat loss through window.

SCHEMATIC:

ASSUMPTIONS: (1) One-dimensional conduction in the x-direction, (2) Steady-state conditions, (3) Constant properties.

ANALYSIS: Subject to the foregoing conditions the heat flux may be computed from Fourier's law, Eq. 1.2.

$$q_X'' = k \frac{T_1 - T_2}{L}$$

$$q_X'' = 1.4 \frac{W}{m \cdot K} \frac{(15\text{-}5)^\circ C}{0.005m}$$

$$q_X'' = 2800 \text{ W/m}^2.$$

Since the heat flux is uniform over the surface, the heat loss (rate) is

$$q = q_X'' \times A$$
$$q = 2800 \text{ W / m}^2 \times 3m^2$$
$$q = 8400 \text{ W}.$$ <

COMMENTS: A linear temperature distribution exists in the glass for the prescribed conditions.