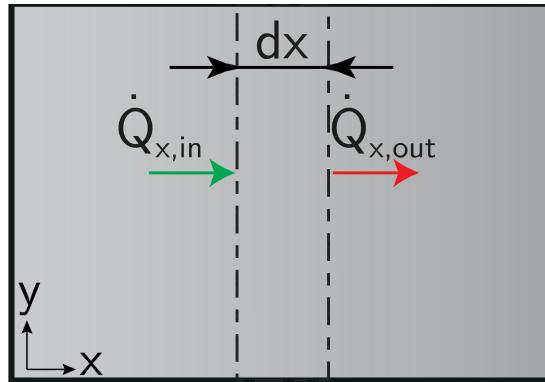


Temperature Function - Cond. - IE 3

The plate is losing heat to the environment. Assume one-dimensional steady-state heat without a source. Provide the temperature function derived from the heat conduction equation



Given the differential equation and boundary conditions:

$$0 = \lambda \frac{\partial^2 T}{\partial x^2}$$

$$T(x = 0) = T_1 \quad \& \quad T(x = L) = T_2$$

Solving the equation:

Integrating twice yields:

$$T(x) = C_1 \cdot x + C_2$$

Substitution of the first boundary condition at $x = 0$ yields:

$$T(0) = C_2 = T_1$$

Substitution of the second boundary condition at $x = L$ yields:

$$T(0) = C_1 \cdot L + C_2 = T_2 \quad \Rightarrow C_1 = \frac{T_2 - T_1}{L}$$

Substitution of the found values for the integration constants gives:

$$T(x) = T_1 \cdot \left(1 - \frac{x}{L}\right) + T_2 \cdot \frac{x}{L}$$