

**Exercise 1.4.10**

Suppose  $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + 4$ ,  $u(x, 0) = f(x)$ ,  $\frac{\partial u}{\partial x}(0, t) = 5$ ,  $\frac{\partial u}{\partial x}(L, t) = 6$ . Calculate the total thermal energy in the one-dimensional rod (as a function of time).