

**Exercise 2.3.11**

Solve the heat equation

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$

subject to the following conditions:

$$u(0, t) = 0 \quad u(L, t) = 0 \quad u(x, 0) = f(x).$$

What happens as  $t \rightarrow \infty$ ? [*Hints:*

1. It is known that if  $u(x, t) = \phi(x)G(t)$ , then  $\frac{1}{kG} \frac{dG}{dt} = \frac{1}{\phi} \frac{d^2\phi}{dx^2}$ .
2. Use formula sheet.]