

Consider the heat equation

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2} \quad 0 \leq x \leq L \quad t > 0$$

subject to the boundary conditions

$$u(0, t) = 0 \quad \text{and} \quad u(L, t) = 0$$

Solve the initial value problem if the temperature is initially

(a)  $u(x, 0) = \sin(5\pi x/L)$

(b)  $u(x, 0) = x$

(c) For part (b), plot the solution at  $t = 0, 0.1, 1$ .