

## Exercise 2

Consider a metal rod ( $0 < x < l$ ), insulated along its sides but not at its ends, which is initially at temperature = 1. Suddenly both ends are plunged into a bath of temperature = 0. Write the differential equation, boundary conditions, and initial condition. Write the formula for the temperature  $u(x, t)$  at later times. In this problem, *assume* the infinite series expansion

$$1 = \frac{4}{\pi} \left( \sin \frac{\pi x}{l} + \frac{1}{3} \sin \frac{3\pi x}{l} + \frac{1}{5} \sin \frac{5\pi x}{l} + \dots \right)$$