

## The Heat and Wave Equations

1. Find a formal solution to the given initial-boundary value problem.

$$\left\{ \begin{array}{l} \frac{\partial u}{\partial t} = 3 \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \pi, \quad t > 0 \\ \frac{\partial u}{\partial x}(0, t) = \frac{\partial u}{\partial x}(\pi, t) = 0, \quad t > 0 \\ u(x, 0) = x, \quad 0 < x < \pi \end{array} \right.$$

2. Find a formal solution to the wave equation governed by the given initial-boundary value problem.

$$\left\{ \begin{array}{l} \frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < 1, \quad t > 0 \\ u(0, t) = u(1, t) = 0, \quad t > 0 \\ u(x, 0) = x(1 - x), \quad 0 < x < 1 \\ \frac{\partial u}{\partial t}(x, 0) = \sin 7\pi x, \quad 0 < x < 1 \end{array} \right.$$