

**Homework 3b**

This homework is due on Thursday, June 11.

Use separation of variables to solve the following problems. Even if this is a form of one done in class, write out the work. You may find the Integrate command in Mathematica (int in Maple) to be quite useful.

1. Solve the following wave equation problem.

$$\begin{aligned}\frac{\partial^2 u}{\partial t^2} &= 9 \frac{\partial^2 u}{\partial x^2} && \text{for } 0 < x < 1, \text{ and } t > 0, \\ u(0, t) &= 0, \\ u(1, t) &= 0, \\ u(x, 0) &= x^2 - x, \text{ and} \\ u_t(x, 0) &= x^3 - x.\end{aligned}$$

2. Solve the following heat equation problem.

$$\begin{aligned}\frac{\partial u}{\partial t} &= \frac{1}{4} \frac{\partial^2 u}{\partial x^2} && \text{for } 0 < x < 1, \text{ and } t > 0, \\ \frac{\partial u}{\partial x}(0, t) &= 0, \\ \frac{\partial u}{\partial x}(1, t) &= 0, && \text{and} \\ u(x, 0) &= x^3 - \frac{3x^2}{2}.\end{aligned}$$