Math. 4581, Practice Test 3

1. Use separation of variables to solve the boundary value problem

$$\begin{cases} u_t t = a^2 u_{xx} - \sigma u_t & \text{for } 0 < x < 1, t > 0, \\ u(0,x) = f(x),\ u_t(0,x) = 0 & \text{for } 0 < x < 1, \\ u(t,0) = u(t,1) = 0 & \text{for } t > 0, \end{cases}$$

where $\sigma$ is a constant such that $|\sigma|$ is small.

2. Find $u(2,1)$ and $u(3.5, 0.5)$ if $u$ solves

$$\begin{cases} u_{tt} - u_{xx} = 0 \quad 0 < x < 2, t > 0 \\ u(0,x) = x^2(2-x)^2,\ u_t(0,x) = x(2-x) \quad 0 \le x \le 2 \\ u(t,0) = u(t,2) = 0 \quad t \ge 0. \end{cases}$$