Applied Math IV: Example Sheet 2

Jiun-Huei Proty Wu

Submission deadline: 4pm, Oct. 21 (Thursday), 2004

1. An infinite string with a mass of 0.03 kg/m is stretched with a force of 300N. It is subjected to an initial displacement of $\cos x$ for $-\pi/2 < x < \pi/2$ and zero for all other x and released from rest.

   (a) Obtain the solution of $u(x,t)$.

   (b) Sketch the displacement of the string for $t = 0.1$s and $t = 1$s.

2. Suppose that a tight string is subjected to the following conditions: $u(0,t) = u(L,t) = \partial u/\partial t(x,0) = 0$, and $u(x,0) = \begin{cases} kx, & 0 < x < L/2 \\ k(L-x), & L/2 \leq x < L \end{cases}$.

   (a) Calculate the first three non-zero eigenmodes (i.e. when $u = \Sigma u_n$) of the solution $u(x,t)$.

   (b) At what t will $u(L/2,t)$ equal to zero?