Name: _____

Math 54, Summer 2009, Lecture 4
"Quiz 13"

(1) Consider the PDE $u_{xx} + u_x - u_t = 0$. Derive a pair of ODEs that $X(x)$ and $T(t)$ would have to satisfy for $u(x,t) = X(x)T(t)$ to satisfy this PDE. (3 points)

(2) (a) Let $f(x) = (1-x)(e^x - 1)$. Set up the Fourier series for f on $[-\pi, \pi]$, and the Fourier sine and cosine series for f on $[0, \pi]$. By "set up", I mean that you do not need to evaluate any integrals, just write them down. (4 points)

(b) Write down a formal solution to the heat problem $\begin{cases} u_t = u_{xx} & 0 < x < \pi, \quad t > 0, \\ u(0,t) = u(\pi,t) = 0 & t > 0, \\ u(x,0) = f(x) & 0 < x < \pi, \end{cases}$
where $f(x)$ is as in (a). Again, do not evaluate any of the integrals. (2 points)