**Fall 2012 - Math 462**
**Partial Differential Equations for Scientists and Engineers**
Homework #4 - Due Monday Oct. 1

1. (30pt) Determine whether the method of separation of variables can be used to replace the following PDE's by a pair of ODE's. If so, find the equations:
   (a) $xu_{xx} + tu_t = 0$
   (b) $u_{xx} + u_{yy} = x$
   (c) $u_x + u_{xt} + u_t = 0$
2. (40pt) Let $\phi(x) = x^2$ for $0 \leq x \leq 1$.
   (a) Calculate its Fourier sine series
   (b) Calculate its Fourier cosine series
3. (30pt) We recall that if $f$ is an odd function, then
$$\int_{-L}^{L} f(x)\,dx = 0.$$
   (a) Use this property to show that if $\phi(x)$ is an odd function, its full Fourier Series on $(-L, L)$ has only sine terms.
   (b) Similarly, show that if $\phi(x)$ is an even function, its full Fourier Series on $(-L, L)$ has only cosine terms.