**Due date: September 26th, 2013**

1. Let $x : [0, \infty) \to \mathbb{R}$ be a solution to the second order differential equation

$$\frac{d^2x}{dt^2}(t) + r(t) = 0$$

with $r$ being a continuous function. Find the two linearly independent solutions of the above, the corresponding Green function, and the general solution to the equation.

2. Let $x : [0, \infty) \to \mathbb{R}$ be a solution to the second order differential equation

$$\frac{d^2x}{dt^2}(t) - x(t) + r(t) = 0$$

with $r$ being a continuous function. Find the two linearly independent solutions of the above, the corresponding Green function, and the general solution to the equation.

3. Let $x : [0, \infty) \to \mathbb{R}$ be a solution to the second order differential equation

$$\frac{d^2x}{dt^2}(t) + x(t) - 2\cos(t) = 0.$$

Find the two linearly independent solutions of the above, the corresponding Green function, and the general solution to the equation.

4. Find a particular solution for each of the following ODEs:

$$\frac{d^2x}{dt^2}(t) + 5\frac{dx}{dt}(t) + 4x(t) = e^{-3t}$$

$$\frac{d^2x}{dt^2}(t) + 5\frac{dx}{dt}(t) + 4x(t) = \cos(2t)$$

$$\frac{d^2x}{dt^2}(t) + 5\frac{dx}{dt}(t) + 4x(t) = 4 + 5t^2$$

5. Write down the general solution for each of the following ODEs:

$$\frac{dx}{dt}(t) + 2x(t) = 2e^{-3t} + 4\sin(3t)$$

$$\frac{d^2x}{dt^2}(t) + 5\frac{dx}{dt}(t) + 4x(t) = e^{-3t} + 4t + 5t^2$$