Phys604/F15/Hassam/Problem Set 10 Due 11/17/15

10.1

Find y(x) if y(0)=0 and y(+∞) = 0 where y(x) satisfies

$(d/dx)[x(dy/dx)] - \nu^2 y/x = S(x)$

and where ν is real, positive and given, and S(x) is given.

(a) Use the Green function method. Posted notes will help but re-do the integration by parts steps to establish the method. It will be useful to keep the (d/dx)[x(dy/dx)] operator as is (ie, don't open it up), especially in the integration by parts as well as in the jump conditions. We are dividing by x in the ODE – assume this is not a problem: can be shown that as one proceeds to the limit, things are well behaved.

(b) Find y(x > b) if S(x) = 1 for x<b and S=0 otherwise.

10.2

(a) Consider the space of periodic functions f(x) in the domain x=[0,b], ie, f(x+b)=f(x). Demonstrate that the operator L = i(d/dx) is Hermitean in this space.

(b) Find the eigenfunctions. Confirm that the eigenvalues are real.