FW EP548

This is a Take home exam. You must work on it alone. You can use the Greenberg book as well as your notes but no other material.

1. Find the general solution to y''' - 6y'' + 11y' - 6y = 0. Write this equation as a 1st order system and find the general solution of the system. Sketch the phase space.

2. (a) Show that e^{At} , where A is an n-by-n matrix and t is time, solves the 1st order system $d\Phi/dt = A\Phi$ by use of the definition of the exponential of a matrix. (b) If $Ax = \lambda x$ then $e^{At}x = ?$, where x is a n-vector and λ a scalar.

3. Find the asymptotic behavior of the solutions of $y'' + y'/x - x^2y = 0$ for large x using the WKBJ method.

4. Solve y'' = f(x) with y(0) = a and y(L) = b using a Green's function as well as by variation of parameters.

5. Find the general solution to y'' - 2xy' + ny = 0 by series solution, where n is an integer.

6. Greenberg 23.17.