Homework 5

1) greenberg page 867 problem 8

2) " " 881 " 5b

3) Solve.

$$(1-x^2)y'' - 2xy' + \lambda y = x^2$$

$$y'(0) = 0$$

$$y(1) = b$$

4) greenberg page 912. Problem 4.

5) Consider the CSTR problem given in class

Let $x_1 = u - u_s$ where (u_s, v_s) is
$x_2 = v - v_s$ any steady state

a) For an adiabatic reactor $(S=0)$, show that $|A| > 0$ (called slope condition) is necessary and sufficient for stability

b) For nonadiabatic case, $S \neq 0$ show there is an additional condition.

6) Problem 7a. greenberg   Page 371

7) Problem 1   "   "

8) Consider.

$$\frac{dx}{dt} = x + y - x(x^2 + y^2)$$

$$\frac{dy}{dt} = -x + y - y(x^2 + y^2)$$

Use polar coordinates to arrive

at $\frac{dr}{dt} = r(1 - r^2)$

$\frac{d\theta}{dt} = -1$

- Find all stable and unstable steady states and limit cycles.

- Consider ∞ as a possible candidate for a "steady state".