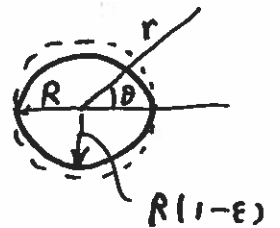1) Use a regular perturbation method and determine the first three terms for the following equation

$$y'' + y' = \varepsilon \quad , \quad y(0) = 0, \quad y(1) = 1$$

2) Find the stream function for the potential flow past a slightly distorted cylinder whose radius is given by

$$r = R(1 - \varepsilon \sin^2 \theta)$$

3) Use the method of matched asymptotic expansion and obtain a uniformly valid solution for the Friedrichs problem

$$\varepsilon f'' + f' = a \qquad f(0) = 0, \quad f(1) = 1.$$

Here, a is constant (not equal to 1) and ε is small. Sketch the inner solution, the outer solution and the composite solution. Compare the result with the exact solution.