Math 605-01 (172) Homework #1

1) Use perturbation theory to find approximate solutions for the roots of

$$x^2 + \epsilon x - 1 = 0$$

where $0 < \epsilon << 1$, and write a code to implement the method.

2) Use perturbation theory to find a series expansion for the solution to the initial value problem

$$\frac{d^2u}{dx^2} + u = \epsilon(1 - u^2)\frac{du}{dx} \ , \ u(0) = 1 \ , \ u'(0) = 0$$

where $0 < \epsilon << 1$, and write a code to implement the method.