HW#7
Due: Sunday: 15-May-2011

Consider the following system of nonlinear BVP's representing the non-isothermal reaction and diffusion in a catalytic slab:

$$\frac{d^2 y_1}{dz^2} - \phi_1 e^{-\varepsilon \left[\frac{1}{y_2} - 1\right]} y_1^2 = 0$$

$$\frac{d^2 y_2}{dz^2} + \gamma \, \phi_1 e^{-\varepsilon \left[\frac{1}{y_2} - 1\right]} y_1^2 = 0$$

$$z = 0 \qquad\qquad \frac{dy_1}{dz} = \frac{dy_2}{dz} = 0$$

$$z = 1 \qquad\qquad y_1 = y_2 = 1$$

Perform the following:
  (a) Discritize the BVP's using Chebyshev collocation method and derive the resulting residual equations.
  (b) Derive the Jacobian Matrix.
  (c) Using $N = 16, \phi_1 = 3.0, \ \varepsilon = 1$ and $\gamma = 0.5$, solve this problem using Code_6-2BVPs.f and send your program by e-mail as yourname-HW7.f.