ASSIGNMENT 5 - due 5 April, 2016

1. Use the finite difference method with $h = \frac{\pi}{12}$ to solve the boundary-value problem

$$y'' = y' + 2y + \cos x, \quad 0 \le x \le \frac{\pi}{2},$$
$$y(0) = -0.3, \quad y\left(\frac{\pi}{2}\right) = -0.1.$$

Write out the linear system then solve it using Matlab. Compare the result with the exact solution $y(x) = -\frac{1}{10}(\sin x + 3\cos x)$.

2. Use the Rayleigh-Ritz method with piecewise linear basis functions to solve the boundary-value problem

$$-x^2y'' - 2xy' + 2y = -4x^2, \quad 0 \le x \le 1,$$
$$y(0) = y(1) = 0.$$

Use a uniform mesh with step size $h = 0.2$. Write out the linear system then solve it using Matlab. Compare your results with the exact solution $y = x^2 - x$.