Computer Assignment #2.   Due October 30, 2018

1. Consider the following elasticity problem:

$$AEu_{,xx} + b(x) = 0 \qquad \text{in }]0,1[$$

where $AE = 1.0$, $b(x) = -e^x$, and

$$u(0) = 1.0$$
$$u_{,x}(1) = e$$

Use finite element method to solve the above problem using linear elements with uniform spacing.

(1) Formulate weak form and Galerkin approximation of this problem.

(2) Obtain finite element solutions by using 5, 10, and 20 linear elements.

(3) Plot finite element solutions u^h and $u^h_{,x}$ as functions of x and compare them to the exact solution $u = e^x$ for the 3 finite element solutions.

(4) Make discussions on the finite element solution accuracy with respect to the element refinement.