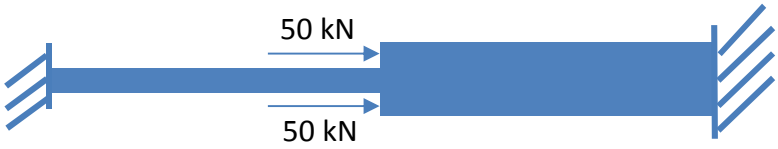
Middle East Technical University
Department of Civil Engineering
Fall 2014

CE 425 Introduction to Finite Elements

Assignment # 6 (due Dec 8, 2014 till 10:00)

1. Solve the following one dimensional problem using a 2 parameter Rayleigh Ritz approximation. Compare your approximate solutions for the u(x) and σ(x) with the exact solution.



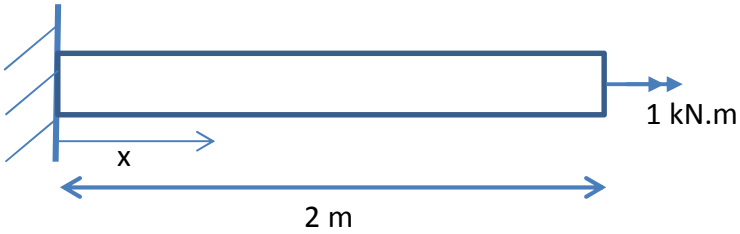
AE=4.0e08 N
L=2 m

AE=12.0e08 N
L=2 m

2. Given the following torsion problem

a. Write the potential energy of the system and the relevant virtual work expression.
b. Find one and two parameter Rayleigh Ritz approximations for the angle of twist.
c. Obtain the exact solution of the problem. Compare the exact solution with the Rayleigh-Ritz approximations.

Radius = 0.05 m
G = 50 * (2 – 0.5 x) GPa



3. a. Find the support reactions using the direct stiffness method. Take spring constant as 1.0e06 N/m. The cross section is 0.05 m x 0.05 m.
b. Derive the potential energy for the system.
c. Write the relevant virtual work expression for the minimization of the potential energy for the system.