Homework #4 (NQe311, Spring, 2020)

KAIST

(Due April 24)

1. Obtain the following integral:

$$\int_{-1}^{1} \frac{2}{1+x^2} dx ,$$

using the following numerical integral schemes:

i) Simpson's rule

and

ii) Gauss-Legendre quadrature,

as a function of the number of nodes, and compare them to the analytic solution.

2. Find the root of the following nonlinear equation

$$f(x) = x + \ln x, \;\; x > 0 ,$$

by

i) Newton's method

ii) Secant method (a quasi-Newton method)

iii) Compare the convergence rates of the two methods above

3. Solve the following system of nonlinear equations

$$\begin{cases} x + y + z = 3 \\ x^2 + y^2 + z^2 = 5 \\ e^x + xy - xz = 1 \end{cases}$$

by using the Newton's method with two initial guesses, $(0.1, 1.2, 2.5)^T$ or $(1,0.1,1)^T$.