ME 542

Assignment – 10

Numerical Integration

- Students need to save all the programs in a zipped file and named after their roll number and submit on MS TEAMS.
- The programs are to be compiled and checked before submitting.
- Make a text file for providing input and your code should read data from the text file.
- Results obtained by your code should be written (do not copy image file of your run) in a pdf file and keep it in the same zipped folder.

1. The function $f(x) = 2e^{-1.5x}$ can be used to generate the following tables of unequally spaced data:

x	0	0.05	0.15	0.25	0.35	0.475	0.6
$F(x)$	2	1.8555	1.5970	1.3746	1.1831	0.9808	0.8131

Evaluate the integral from 0 to 0.6 using (a) Trapezoidal rule, and (b) a combination of all Trapezoidal rule and Simpson's rules to achieve the highest accuracy. Also, determine the percentage of relative error with respect to true value of integration.

2. Integrate $\int_0^2 \frac{e^x \sin x}{1+x^2} dx$ using two-, three-, and four-point Gauss-Legendre formulas. Compute error for each case on the basis of the analytical solution. You may take values of Gauss points and weights from https://pomax.github.io/bezierinfo/legendre-gauss.html

Note that the exact value can be evaluated manually or using some software package.