LE 230 Homework : Numerical Integration

Please show all details of your solutions.

6-1 Evaluate the following integrals analytically and numerically

(a) $\int_0^{\pi/2}(1+2\cos x)dx$ (b) $\int_0^3(1-e^{-x})dx$

(c) $\int_0^1(x^2\sinh x+\tan^{-1}x)dx$ (d) $\int_1^2(x+1/x)^2dx$

using

(i) midpoint rule (find n such that error less than 10^{-6})

(ii) trapezoidal rule (find n such that error less than 10^{-6})

(iii) Simpson rule (find n such that error less than 10^{-6})

(iv) Romberg integral up to R(3,3)

(v) Gauss quadrature with n = 2, 3, 4

6-2 Evaluate the following integrals numerically

(a) $\int_0^2\frac{e^x\sin x}{1+x^2}dx$ (b) $\frac{2}{\sqrt{\pi}}\int_0^1 e^{-x^2}dx$

(c) $\int_1^2\frac{\sin x}{x}dx$ (d) $\int_1^2\frac{1-\cos x}{x}dx$

using the methods specified in problem 6-1. Here, choose an appropriate n for midpoint, trapezoidal, and Simpson methods.