Numerical Analysis MAT 362: Homework 6

Due on Wednesday, March 15 in class

Please read the Instructions

- **Show all the steps that you go between the question and the answer. Show how you derived the answer. For your work to be complete, you need to explain your reasoning and make your computations clear.**
- **You will be graded on the readability of your work.**
- **The correct answer with no or incorrect work will earn you NO marks**
- **Show ALL your work**
- Use only four decimal places for all numbers.
- **If possible, use 8.5" × 11" white paper (not torn from spiral binders) and staple sheets together.**
- Print your name legibly in the upper corner of the page.
- Write your solutions as though you're trying to convince someone that you know what you're talking about.
- **Failure to follow these instructions will result in loss points (up to the full amount of the homework total)**

Problem 1

(Elements of Numerical Integration)
Apply the Trapezoid and Simpson's Rule to approximate

$$\int_1^2 \ln x \, dx$$

and find an upper bound for the error in the your approximation.

Problem 2

(Composite numerical integration)
Approximate $\int_0^1 e^{x^2} \, dx$ using 4 subintervals in (a) Composite Trapezoidal Rule, (b) Composite Midpoint Rule, (c) Composite Simpson's Rule.

Problem 3

(Composite numerical integration)

Approximate $\int_1^4 \sin x \, dx$ using 6 subintervals in (a) Composite Trapezoidal Rule, (b) Composite Midpoint Rule, (c) Composite Simpson's Rule.

Problem 4

(Composite numerical integration)

Find the step size h and the number of subintervals n required to approximate $\int_1^3 x^2 \ln x \, dx$ correct within 10^{-4} using (a) Composite Trapezoidal Rule, (b) Composite Midpoint Rule, (c) Composite Simpson's Rule.