

Numerical Analysis - Homework 16

Professor:

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Office Hours:

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Homework Problems

For this homework you will write your own code. You can build from the numerical integration code, but you need to add the error analysis parts.

- Do Chapter 5.2 problems 1(a,b), 5(a,b), and 6(a,b)
 - First do the problems by hand - as directed by the book
 - Then use your code to confirm your results. In other words, solve the integrals using code for the method suggested AND compare the error you get in the code to the error you expect to get based on your error bounds. Remember $Error = Exact - Approximate$ so you will need to find the exact answer by either doing the integral or using scipy if you can't do the integral by hand.
- Non-book problem: Investigate the convergence of TRAP(n) and SIMP(n) for the integral

$$\int_0^1 \sqrt{x} \, dx = \frac{2}{3}$$

What do you expect by doing the error analysis by hand? What is causing trouble in the error analysis? Then use your code to calculate the integral for $n = [2, 4, 8, 16, 64, 128]$ and discuss the convergence by looking at the ratio of errors. Discuss what is happening here!

You should attempt all these problems before class, but we will work on them in class with our groups. NOTE: problem 10 would be a good above and beyond exploration.