Mcs275, Spring 2011, Week6 Lab, Extending Python

Trapezoidal Rule for Integration:

$$I = \int_a^b f(x)dx \approx h\left[\frac{1}{2}f(a) + f(x_1) + \cdots + f_{n-1} + \frac{1}{2}f(b)\right]$$

where $h = (b-a)/n$

- Create a directory for your all of your lab work and cd into it. Include a README file.
- In all parts below, include a makefile similar to class examples.
- Your code must run on raphael.math.uic.edu
- Follow any instructions given by your TA.

Part I

- Create a sub-directory named python and cd into it. Create a python program with two files main.py and trapez.py
- The module trapez.py will be imported into main. In trapez.py define a function to use the trapazoidal rule to evaluate the integral of $f(x) = e^{-x^2}$ The function will be called from main with trapez(a,b,n). As a test, trapez(0,1,10) should return $I = 0.1(.5 * (1.000000 + 0.367879) + 6.778167) = .746211$ You can use check your answers with different parameters by using WolframAlpha.

Part II

- Create a sub-directory named C-test. In this directory rewrite both modules in the C programming

language. Test your code.

Part III

- Create a sub-directory named pyximport. In this directory include your main.py file and use the pyximport module to extend trapez.py using cython. Test your code. Include as many cdef's etc. that makes sense.

Part IV

- Create a sub-directory named setupCython. In this directory include main.py and extend trapez.py by using cython and a setup.py file.

Part V

- Create a sub-directory named gccCython. In this directory include main.py and extend trapez.py by using cython and gcc.

Part VI

- Create a sub-directory named C-API. In this directory include main.py and extend trapez.py by using C-API.

Part VII

- Finally, use some timing code to compare the python, cython and C-API versions. State your conclusions in your README file.