Spring, 2017

Physics 6810: Assignment #1b

This assignment is the continuation of Assignment #1a. The due date for this part is midnight, Wednesday, February 1.

You can use either BuckeyeBox or Dropbox to "hand in" the assignment. Put your homework inside a subfolder named `PS_1b` or `Assignment1b` or similar.

Use C++ for the codes and gnuplot for the plots. *It is required that your code have appropriate comments.* Comment your codes with your name, email, AND revision history, as in the example codes from class. Check the 6810 webpage for suggestions and hints.

3. **Spherical Bessel Functions.**

   The goal here is to complete (some of) the Bessel function activities from Session 2. In particular,

   (a) Turn in a code that generates the output file needed for Bessel 2, part 3.

   (b) Turn in a postscript plot of the error vs. x made from that output file *with your interpretation of the different regions of the graph.* (Put your analysis in the comments at the top of your code from (a).)

   (c) Add the GSL routine (from Bessel 3) to your code (so only one code is needed in the end), with a new column in the output file being $j_{10}(x)$ from GSL.

4. (BONUS) **Randomness of round-off errors.**

   [This is not a required program, but I recommend giving it a try if you found the other parts easy.] In the book "Computational Physics", Landau and Paez say that the round-off errors in single-precision are distributed approximately randomly. Your task is to test whether this is true and what the distribution actually looks like. More specifically, if we generate a large set of $z_c = z(1 + \epsilon)$ numbers from some sufficiently complex calculation (e.g., by taking the square root of a bunch of numbers), how are the different ϵ's distributed?

   (a) Devise a scheme to test for the distribution of round-off errors.

   (b) Carry out your scheme with a C++ program.

   (c) Make appropriate plots to explore your results.