PHY566 Homework #5

Due Date: March 15th, 9:00pm via Sakai

Random Numbers

Write a program that initializes and calls the random number generator.

a) Generate 1,000 random numbers, evenly distributed between 0 and 1. Analyze the distribution of random numbers with increasing resolution, by plotting the probability distribution of your random numbers, first with 10 subdivisions, then 20, 50 and finally 100 subdivisions. Repeat the exercise on a sample of 1,000,000 random numbers. [5 points]

b) Do the same as in part (a), but now with a sample of random numbers distributed according to a Gaussian distribution with width $\sigma = 1.0$:

$$P(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}}$$

In order to generate the Gaussian distributed random numbers, use the same random number generator as in part (a), and apply one of the methods discussed in class or one of the common methods found in the literature (Box-Muller algorithm, Marsaglia-Tsang ziggurat or Kinderman-Monahan-Leva ratio methods). Verify your algorithm for generating random numbers by overlaying a Gaussian onto the plots of the distributions you generate. [5 points]

Your homework submission should consist of:

- a document outlining the problem, detailing your solution and discussion of your results - the document should include the requested figures. The document should be in pdf format and you should use colors and different marker symbols to enhance the readability of your figures.
- the source code of your program