Math 181 HW7

Handout: Wednesday, 11/19
Due: Wednesday, 11/26

1. For the integral

$$I = \int_0^1 x \, dx$$

and with desired accuracy $\varepsilon = 10^{-4}$, find the required number of Monte Carlo points N.

2. Suppose that an integral $I[f]$ is approximated by 10 Monte Carlo sums each with $N = 10^2$, with resulting values

$$.4,\ 0.8,\ 1.0,\ 1.3,\ 1.5,\ 1.6,\ 1.8,\ 2.0,\ 2.2,\ 2.3$$

Find an approximate value for the variance σ_f.

Download the Monte Carlo excel programs

- callMC.xls
- putMC.xls

from the class web site (from www.math.ucla.edu/ caflisch/ go to Math181 in list of current courses).

To access the program in these files, go to Tools → Macros → Visual Basic Editor.

3. Run the program in its original form and print out the results from Sheet1 Change the numerical inputs (current price, volatility, interest rate, etc.) and rerun and print.

4. Change the program to perform Monte Carlo integration of the following functions

- x^4 in which x is a gaussian random variable
- x^4 in which x is a uniform random variable

Print out the output for each of these.

5. Use the Monte Carlo program to calculate the value of an option with payout defined by

$$f = (\max\{0, S_T - X\})^2$$

in which $S_0 = X = 1$, $T = 1$, $\sigma = .2$ and $r = .1$. Do the calculation for $N = 16, 32, 64, \cdots, 2048$, and list the resulting empirical error (averaged over 20 runs) as a function of N.

You may modify and use the excel program that is on the course web site for this purpose.