PROBLEM SET 6 [Due Tuesday, March 12]

Physics 210– Computational Physics

The goal of this problem set is to apply the Metropolis algorithm and verify it generates the correct probability distribution for a few simple examples.

[**1.**] Use the Metropolis algorithm to generate x with distibution $p(x) \propto e^{-|x|/\lambda}$. First make a histogram of the x values and compare with $p(x)$. Then compute the moments $\langle x^p \rangle$ for $p = 1, 2, 3$ and 4 and verify your program gives the right values.

[**2.**] Use the Metropolis algorithm to generate x with distibution $p(x) = \frac{3}{2}$ for $0 < x < \frac{1}{2}$, $p(x) = \frac{1}{2}$ for $\frac{1}{2} < x < 1$, and $p(x) = 0$ otherwise. First make a histogram of the x values and compare with $p(x)$. Then compute the moments $\langle x^p \rangle$ for $p = 1, 2, 3$ and 4 and verify your program gives the right values.

[**3.**] Use the Metropolis algorithm to generate values of the *discrete* variable $n = 1, 2, 3, ...$ with distibution $p(n) \propto \frac{1}{n^3}$. First make a histogram of the n values and compare with $p(n)$. Then compute the moment $\langle n \rangle$ and verify your program gives the right value.