Problem Set # 4
Due Date: 21 February 2007

Problems #1 and 2
Problems 8.11 and 8.20 from Miller’s Book.

Problem #3

Consider the so-called random telegraph signal, \(x(t)\) (shown below).
In this signal, which started in time at \(-\infty\) and will continue to \(+\infty\), the voltage flips back and forth, between 
\(+A\) volts and \(-A\) volts, in the following manner.

The switching times, are dictated by a Poisson distribution, i.e., the probability of “k” flips in \(\tau\) seconds is given by the Poisson distribution function

\[
\text{Prob} \{\text{of “k” flips in } \tau \text{ seconds}\} = \frac{e^{-\lambda\tau}(\lambda\tau)^k}{k!}
\]

for \(k=0, 1, 2, \ldots, \infty\).
a) Find the autocorrelation function, \( E\{x(t+\tau) \, x(t)\} \) of random process, \( x(t) \), and show that it is only a function of \( \tau \).

b) Show that the \( E\{x(t)\} \) is just a constant. Therefore, this process is WSS.

c) Find and draw the Power Spectral Density, \( P_x(f) \), of the random process.

d) Repeat the parts above if the voltage flips between \(+A\) and \(0\) (not \(-A\))

Hint: If you are having a problem, look at pp.376-377, in Miller and Childers.

**Problem #4 and 5**
Problems -1.5 and 1.8 in Chapter 1 of Haykin’s Book (which may be found in the library).