Problem Set 2: MAE 127

due Friday, April 15, 2005

1. Use the randn function in Matlab to produce a large set ($O(10^6)$) of normally distributed random numbers. Plot the pdf of these numbers. Compute the first four moments of the empirical pdf. What are the skewness and kurtosis?

2. Look at the wind data from the buoy data file that we used last week. Plot the wind velocity components and wind speed as pdfs. Since the data set provides wind speed and direction, you'll first you'll have to compute the eastward and northward wind velocities using the wind speed multiplied by the sine and cosine of the wind direction. Keep in mind that the Matlab sine and cosine functions use angles in radians rather than degrees. How would you describe the pdfs? Are they Gaussian? What are the first four moments of the data distributions?

3. Consider a pdf of the form:

$$P(x)\,dx = \begin{cases} (1+x)\,dx & \text{for } -1 < x \leq 0 \\ (1-x)\,dx & \text{for } 0 \leq x < 1 \\ 0. & \text{otherwise} \end{cases}$$

What are the mean, standard deviation, and kurtosis of data drawn from this distribution? (Hint: This problem is probably most easily done by hand, without recourse to Matlab.)