Atmospheric Sciences 5270: Wind Power Meterology
Exercise 3

For Problems 2 and 3: Use the wind data and Matlab code linked to the class web page. The code is given as a text file that you can edit.

Problems:

1. Find u_* and z_0 from the following wind profile measurements made during statically neutral conditions at sunset:

z (m)	$\bar{u}$ (m/s)
1	4.6
3	6.0
10	7.6
30	9.0

2. (a) Determine how the wind power density increases with height by calculating the annual average wind power density at each height using the hourly wind speed data for 1997 at the National Wind Technology Center M2 Tower. Use density = 1 kg m^{-3}.

   (b) What is the percentage increase in wind power density at 50 m and 80 m relative to that at 20 m?

3. (a) Calculate the average wind speed profile for each season of 1997 at the National Wind Technology Center M2 Tower.

   (b) Plot the average wind speed profile obtained in part (a) versus height, z, and also versus $\log z$.

   (c) Is the log wind profile a good approximation?