# 1016-345-01
# Probability and Statistics for Engineers

Problem Set 3

Assigned 2013 March 19
Due 2013 March 26

**Show your work on all problems! If you use a computer to assist with numerical computations, turn in your source code as well.**

## 1 Devore Chapter 3, Problem 86

## 2 Devore Chapter 3, Problem 88

## 3 Devore Chapter 4, Problem 8

## 4 Devore Chapter 4, Problem 20

## 5 Computational Exercise (Extra Credit)

In this problem you simulate an approximate Poisson process and verify that it agrees with the pmf for the Poisson distribution. The scenario is the "beetle problem" described in the notes: a $1000' \times 1000'$ field contains 4.5 million beetles, each located randomly and independent of the others. We divide the field into a million square-foot patches, so that the average number of beetles per patch is $\mu = 4.5$, and randomly distribute the beetles as follows:

**a.** Using a random number generator, assign each of the 4.5 million beetles to one of the million patches. (I.e., generate a vector of 4.5 million integers, each randomly and independently chosen to lie between 1 and 1 million.)

**b.** Count the number of beetles in each of the 1 million patches, which will give you a vector of 1 million integers. (It's convenient to use a histogram function if you have one available.)

**c.** Now take the vector from part b) and make a histogram from that, giving you a vector containing the number of patches with 0 beetles, 1 beetle, 2 beetles, etc.

**d.** Divide the values in the vector from part c) by 1 million to obtain a vector of the relative frequency of $x$-beetle patches, and plot it on the same set of axes as the Poisson pmf $p(x, 4.5) = \frac{(4.5)^x}{x!} e^{-4.5}$.