MATH 396 QUIZ II

1) Find the maximum likelihood estimate for the pdf

$$p_X(k;\theta) = \frac{\theta^{2k}e^{-\theta^2}}{k!}, \quad k = 0,\ 1,\ 2, \ldots$$

How can you tell if this is unbiased? *Hint:* Poisson.

2) Using the method of moments, derive formulas for estimating the parameters r and p in

$$p_X(k;r,p) = \left(\begin{array}{c} k-1 \\ r-1 \end{array} \right) p^r(1-p)^{k-r} \quad k = r,\ r+1,\ \ldots.$$

Suppose r is given. What does MLE give for p?

3) Suppose a coin is tossed n times for the purpose of estimating $p = P(\text{heads})$. How large must n be in order to guarantee the length of the 90 % confidence interval is less than 0.01?

4) Let $Y_1,\ Y_2,\ \ldots,\ Y_n$ be a sample from the pdf

$$f_Y(y;\theta) = \frac{1}{\theta}e^{-y/\theta}, \quad y > 0.$$

Let $\hat{\theta} = nY_{min}$. Is $\hat{\theta}$ unbiased for θ? Is $\hat{\theta} = \frac{1}{n}\sum_{i=1}^{n} Y_i$ unbiased?