# Ma 494 — Theoretical Statistics

## Problem Set #1 — Due January 29, 2010

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Problems in text are from Richard J. Larsen and Morris L. Marx, *An Introduction to Mathematical Statistics and Its Applications*, 4th edn, (Pearson/Prentice Hall, 2006)

**1.** (Like Problem 5.2.3 p355) Let $f(x, r) = re^{-rx}$ for $x > 0$ and $r > 0$.

(a) Let 8.2, 9.1, 10.6, 4.9 be an independent sample of size 4 from $f(x, r)$. Find the maximum likelihood estimator of $r$ (and show how you derived it).

(b) Let $Y_1, Y_2, ..., Y_n$ be an independent sample of size $n$ from $f(x, r)$. Find a formula for the maximum likelihood estimator of $r$ in terms of $n$ and $Y_1, Y_2, .., Y_n$.

**2, 3, 4, 5:** Problems 5.2.4, 5.2.6, 5.2.10, and 5.2.12.

*Hints and Warnings:* Note that $\theta < X_i < 1$ in Problem 5.2.10, since otherwise the normalizing constant (so that the integral of the density is one) would not be $1/(1 - \theta^2)$. Assume $0 \le \theta < 1$ in Problem 5.2.10. In Problem 5.2.12, assume that $k > 0$ is a fixed known constant.