## **HW 5**

Problem 1: Let  $X_1, X_2, \ldots, X_n$  i.i.d. Normal  $(\mu, 1)$ . Create a data set (using  $\mu = 5$ ) with n = 100.

Let  $\theta = e^{\mu}$ .

(a) Find MLE of  $\theta$ .

(b) Use the delta method to get  $\hat{sd}$  (or  $\hat{se}$ ) of  $\theta$  and a 95% confidence interval for  $\theta$ .

Problem 2: Let  $X_1, X_2, \ldots, X_n$  i.i.d. Poisson  $(\lambda)$ .

(a) Let T(X) be an unbiased estimator of  $\lambda$ . Show that  $var(T) \ge \lambda/n$ . (b) Let  $\delta(X)$  be an unbiased estimator of  $\lambda^2$ . Show that  $var(\delta) \ge 4\lambda^3/n$ .

- (c) Can you find an estimator to attain the lower bound  $\lambda/n$  in (a)? (d) Can you find an estimator to attain the lower bound  $4\lambda^3/n$  in (b)?