Math 498
Quiz 3

You should use the inside front and back covers of the textbook as a cheat sheet. You also should use the tables in the back of the textbook.

Justify all answers with neat and organized work. Clearly indicate your answers. 40 points possible.

1. (10 pts.) A pet store sells gerbil food in 2-pound bags that are weighed on the platform of an old 25-pound scale. Suppose that it is known that the standard deviation of weights is $\sigma = 0.15$ pound. If a sample of 18 bags of gerbil food were weighed carefully in a laboratory and the average weight was 2.07 pounds, find an approximate 95% confidence interval for the mean weight of gerbil food in the 2-pound bags sold by the pet store.

2. (15 pts.) Let X be Poisson with mean λ.

(a) Find the likelihood function $L(\lambda)$ of a random sample of size 3 of X at the point $(2, 3, 5)$. Using the methods of calculus, derive the maximum likelihood estimate of λ at this point.

(b) Find the likelihood function $L(\lambda)$ of a random sample of size n of X at the point $(x_1, \ldots, x_n)$. Using the methods of calculus, derive the maximum likelihood estimate of λ at this point.

(c) Find the method of moments estimator for the parameter λ.

3. (15 pts.) Let X be exponential with mean $\theta = 1/\lambda$ (so that X has p.d.f. $f(x) = \lambda e^{-\lambda x}$ for $x \geq 0$).

(a) Find the likelihood function $L(\lambda)$ of a random sample of size 4 of X at the point $(6, 6.4, 5.9, 7)$. Using the methods of calculus, derive the maximum likelihood estimate of λ at this point.

(b) Find the likelihood function $L(\lambda)$ of a random sample of size n of X at the point $(x_1, \ldots, x_n)$. Using the methods of calculus, derive the maximum likelihood estimate of λ at this point.

(c) Find the method of moments estimator for the parameter λ.