# STA261: Assignment 5

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This assignment is not for credit. Complete the questions as preparation for quizzes and tests.

Suggested reading: Textbook sections 8.7

Do the following questions from textbook section 8.10 (starting on page 312): 6(a),(b)

1. Let $X_i \sim N(\mu, \sigma)$.
   (a) Suppose $\sigma$ is *known*. Find the MLE for $\mu$, and show that it is both *unbiased* and *efficient*.
   (b) Suppose $\mu$ is *known*. Find the MLE for $\sigma^2$, and show that it is both *unbiased* and *efficient*.
2. Let $X_i \sim Exp(\theta)$ with density
$$f(x|\theta) = \frac{1}{\theta} e^{-\frac{x}{\theta}}$$
Show that $\hat{\theta} = \bar{X}$ is unbiased, and efficient.
3. Let $X_i \sim Cauchy(\theta)$ be a random sample from the Cauchy distribution, with density
$$f(x|\theta) = \frac{1}{\pi\theta\left(1 + \left(\frac{x}{\theta}\right)^2\right)}$$
Is it possible to find an unbiased estimator of $\theta$? Why or why not?
4. State and prove the Cramer-Rao Lower Bound for the variance of an unbiased estimator. This proof is in the textbook.