Math 1620 Homework 7
Due April 7

1. Let $S = \{X_1, \ldots, X_n\}$ be a sample from a normal distribution with mean zero and unknown variance σ^2. Compare $\mathrm{Var}(S)$ and $\frac{1}{n}\sum X_i^2$ as estimators of σ^2.

2. In the previous problem, is the sample SD an unbiased estimator of σ? (Hint: consider for example the case $n = 2$).

3. In Problem 1, what does the Cramer-Rao inequality tell us about the variance of an unbiased estimator of σ?

4. 4 sample points are drawn from the uniform distribution on an interval $[0, t]$, where t is unknown. They are $\{1.1, 4.1, 2.3, 3.5\}$, rounded to the nearest 0.1. What is your best guess for t? What if the four points are $\{1.1, 4.1, 2.3, 10\}$?

5. Let X be a random variable with a binomial distribution with parameters n and p. Is $n\frac{X}{n}(1 - \frac{X}{n})$ a minimum variance unbiased estimator for the variance of X?