Homework 7

Do the problems on webwork and turn the following problems in class on Oct. 29st.

Homework should be written neatly and clearly explained. If it requires more than one sheet, the sheets must be stapled. Include your name and id number in the top right corner of your homework.

Problem 1. (a) Simulate 1000 gamma random variables with $\alpha = 3$ and $\beta = 2$. Plot the histogram of your random sample.

(b) What is the mean and variance of your random sample?

(c) Use R to plot the pdf and CDF of a gamma random variable with $\alpha = 3$ and $\beta = 2$. To ensure that you get a good picture, your plot should include the interval $[0, \mu + 3\sigma]$ where μ and σ are the mean and standard deviation, respectively, of a gamma random variable with $\alpha = 3$ and $\beta = 2$.

(d) Use R to determine
$$\mathbb{P}(X > \mu + 3\sigma)$$
where X is a gamma random variable with $\alpha = 3$ and $\beta = 2$. Verify that this number is smaller than the bound that Tchebysheff's bound gives.

Problem 2. (a) Simulate 1000 binomial random variables with $n = 100$ and $p = .5$. Plot the histogram of your random sample.

(b) Simulate 1000 normal random variables, having the same mean and standard deviation as the binomial random variables in part a)
Your histograms should look similar.

Problem 3. Let X be a random variable with pdf
$$f_X(x) = \begin{cases} \frac{x}{2}, & \text{if } 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

(a) Compute the moment generating function of X.

(b) Use the moment generating function to compute the mean of X.