ECEn 370
Homework #10

1. Bertsekas and Tsitsiklis, 5.1
2. Bertsekas and Tsitsiklis, 5.4
3. Bertsekas and Tsitsiklis, 5.5
4. Bertsekas and Tsitsiklis, 5.9
5. Bertsekas and Tsitsiklis, 5.11
6. Let Y be a binomial random variable with parameters (n, p). Using the central limit theorem, derive the approximation

$$P(Y \leq y) \approx \Phi\left(\frac{y - np}{\sqrt{np(1-p)}}\right),$$

   where $\Phi(z)$ is the cdf of a standard normal random variable.

7. Let Y be a Poissan random variable with parameter λ. Using the central limit theorem, derive the approximation

$$P(Y \leq y) \approx \Phi\left(\frac{y - \lambda}{\sqrt{\lambda}}\right).$$

8. MATLAB Exercise (Viewing the central limit theorem) Let X_i be a uniform random variable over the interval $[0, 1]$. Let $Y = X_1 + \cdots + X_N$. For each $N = 1, 2, 3, 5, 10, 100$ do the following:

   (a) Find the mean and standard deviation of Y.

   (b) Simulate Y by generating 10,000 points of Y. Plot the estimate of the pdf by dividing the raw histogram by both the total number of points (estimate of probability per interval) and by the length of each interval (estimate of probability density per interval).

   (c) On the sam egraph as the histogram (use the "hold on" and "hold off" commands), plot a Gaussian (normal) random variable with the mean and standard deviation for Y.

   (d) Compare the plots obtained in part (b) and (c).

   (e) Do the means and standard deviations agree with what you found in part (a)?

9. MATLAB Exercise. Repeat the previous problem where X_i is an exponential random variable with parameter $\lambda = 1$.