Ma 322: Biostatistics
Homework Assignment 2

Prof. Wickerhauser

Read Chapter 7, pages 80–107, of our e-text to review some basic probability density functions and their properties, concentrating especially on the normal pdf. Consult Chapters 1-5 as needed to find function names and syntax to solve the computation problems below.

1. On a single graph, plot the exponential pdf $p(t) = \lambda e^{-\lambda t}$ over the interval $0 \le t \le 3$ for the values $\lambda = 1.5$, $\lambda = 1$, and $\lambda = 0.5$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

2. On a single graph, plot the normal pdf $p(t) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(t-\mu)^2/2\sigma^2}$ over the interval $-3 \le t \le 3$ for $\mu = 0$ and the values $\sigma = 1.5$, $\sigma = 1$, and $\sigma = 0.5$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

3. On a single graph, plot the Gamma pdf $p(t) = \frac{1}{\beta^\alpha \Gamma(\alpha)} t^{\alpha-1} e^{-t/\beta}$ over the interval $0 \le t \le 10$ for the values $(\alpha, \beta) = (1, 1)$, $(\alpha, \beta) = (1, 2)$, $(\alpha, \beta) = (2, 1)$, and $(\alpha, \beta) = (2, 2)$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

4. On a single graph, plot the Beta pdf $p(t) = \frac{1}{B(\alpha,\beta)} t^{\alpha-1}(1-t)^{\beta-1}$ over the interval $0 \le t \le 1$ for the values $(\alpha, \beta) = (1, 1)$, $(\alpha, \beta) = (2, 5)$, $(\alpha, \beta) = (8, 2)$, and $(\alpha, \beta) = (8, 5)$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

5. On a single graph, plot the Chi squared (χ^2) pdf $p(t) = \frac{1}{2^{k/2}\Gamma(k/2)} t^{k/2-1} e^{-t/2}$ over the interval $0 \le t \le 10$ for the values $k = 2$, $k = 3$, and $k = 7$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

6. On a single graph, plot the binomial pdf $p(k) = \binom{n}{k} s^k (1-s)^{n-k}$ for $n = 100$ Bernoulli trials over the interval $0 \le k \le n$ for the success rate values $s = 0.1$, $s = 0.2$, $s = 0.5$, and $s = 0.9$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.

7. On a single graph, plot the Poisson pdf $p(k) = e^{-\lambda}\lambda^k/k!$ over the interval $0 \le k \le 100$ for the mean count values $\lambda = 5$, $\lambda = 10$, $\lambda = 20$, and $\lambda = 50$.

   Be sure to choose axes so that the maximum value of each pdf can be seen.