Homework 08_5 (Due: 4/7)

1. X is an Erlang (n, λ) random variable with parameter $\lambda = 2$.

   (1) Show that $Var[X] = \frac{n}{\lambda^2}$.

   (2) What is $P[0.5 \le X < 1.5]$ when $E[X] = 1$?

2. In a certain "junior" Olympics, javelin throw distances are well approximated by a Gaussian distribution for which $\mu_X = 30m$ and $\sigma_X = 5m$. In a qualifying round, contestants must throw farther than 26*m* to qualify. In the main event the record throw is 42*m*.
   (1) What is the probability of being disqualified in the qualifying round?
   (2) In the main event what is the probability the record will be broken?
3. Let X be a random variable with CDF

$$F_X(x) = \begin{cases} 0 & -1 > x, \\ x/5 + 3/5 & -1 \le x < 1, \\ 1 & 1 \le x. \end{cases}$$

   (1) Find $P[X < -1]$ and $P[X \le -1]$.

   (2) Find $f_X(x)$.

   (3) Find $Var[X]$.

4. The voltage X across a 1Ω register is a uniform random variable with parameters -1 and 1. The instantaneous power is $Y = X^2$. Find the CDF $F_Y(y)$ and the PDF $f_Y(y)$.
5. Text Problem 3.9.6.