Math 262

Section 2.5 Day 11

1. Suppose that during a meteor shower, ten visible meteors per hour are expected.

   (a) Let X be the number of visible meteors in one hour. What assumptions must we make in order to say that X has a Poisson distribution?

   (b) What is the probability that $5 \leq X \leq 15$?

2. Suppose that the number of phone calls an office receives has a Poisson distribution with a mean of 5 calls per hour.

   (a) What is the probability that exactly 7 calls are received between 10:00 and 11:00?

   (b) What is the probability that more than 7 calls are received between 10:00 and 11:00?

   (c) What is the probability that exactly 10 calls are received between 10:00 and 12:00?

3. Suppose that a machine produces items, 2% of which are defective. Let X be the number of defective items among 500 randomly-selected items produced by the machine.

   (a) What is the distribution of X?

   (b) What are the mean and variance of X?

   (c) What is $P(X = 12)$?

   (d) What Poisson distribution approximates the distribution of X?

   (e) Use your Poisson distribution to approximate $P(X = 12)$.

4. Let $X \sim \text{Poisson}(\mu)$. Show that $P(X = k)$ increases monotonically and then decreases monotonically as k increases, reaching its maximum when k is the largest integer less than or equal to μ.
   Hint: Consider $\dfrac{P(X = k)}{P(X = k - 1)}$.