Exercise sheet 7

Probability and Statistics, MTH102

- 1. The average number of typos in a certain newspaper is 0.3. What is the probability that the newspaper has more than 3 typos?
- 2. The probability of winning in a particular game is 0.01. Use the Poisson approximation to compute the probability of winning in 5 out of 10000 games.
- 3. If X is a Poisson random variable with parameter λ , then show the following relations on the moments: $E[X^n] = \lambda E[(X+1)^{n-1}]$.
- 4. If X is a Poisson random variable with parameter λ , then p(i) increases and then decreases. Compute p(i+1)/p(i) and use that to find out for which value of i the p(i) will attain its maximum value.
- 5. If X is a continuous random variable with density function $f_X(x)$ defined so that $f_X(x) = c$ as long as a < x < b, and 0 otherwise, then what should the value of c be so that it is a valid density function?
- 6. If X and Y are continuous random variables, prove the following counterparts of discrete random variables:
 - (a) E[aX + b] = aE[X] + b for any numbers a and b
 - (b) E[X + Y] = E[X] + E[Y]
 - (c) $Var(aX + b) = a^2 Var(X)$
- 7. Let X be a continuous random variable that cannot take negative values. Show the Markov's inequality, i.e. $P\{X \ge k\} \le \frac{E[X]}{k}$. Why does the Weak Law of large numbers hold for continuous random variables too?