Econ4130 11H

Exercises for seminar week 42

Rice, chapter 4: No. **75, 83** (use the mgf), **85** (see hint), **100** (read section 4.6 in Rice and (A4-5) in appendix 1 in Lecture notes to Rice chapter 5".)

Rice, chapter 5: No. **4**, **12**

Hint for ex 4:85: Remember the sum of a geometric series:

$$1+a+a^2+a^3+\cdots \quad =\sum_{i=0}^{\infty} a^i = \frac{1}{1-a} \quad \text{for all numbers, } a\text{, such that } |a|<1.$$

A common factor in such a series can be taken outside the sum as for finite sums:

$$\sum_{i=0}^{\infty} ca^i = c\sum_{i=0}^{\infty} a^i$$

Hint for ex 5:4: Remember from the basic course, Stat I, that if X is poisson distributed with parameter, m, $X \sim \text{pois}(m)$, we know that $E(X)=\text{var}(X)=m$, and if $m \geq 10$ (about), then X is approximately normally distributed, $X \overset{\text{approximately}}{\sim} N\big(E(X),\text{var}(X)\big)=N(m,m)$. Use this.

Hint for ex 5:12: Use the central limit theorem (CLT) (Rice Theorem B on page 184), which says that if $X_1, X_2, \ldots$ are *iid* random variables with $E(X_i)=0$ and $\text{var}(X_i)=\sigma^2$, then the sum, $S_n=\sum_{i=1}^{n} X_i$, is approximately $N\left(0, n\sigma^2\right)$ distributed for large n. This the same as saying that $\frac{S_n}{\sigma\sqrt{n}} \overset{\text{approximately}}{\sim} N\left(0,1\right)$, or $P\left(\frac{S_n}{\sigma\sqrt{n}} \leq x\right) \approx \Phi(x)$, where $\Phi(x)$ is the cdf in $N\left(0,1\right)$.