MTH 4581: Fall 2018: Prof. C. King

Homework 1

Reading: notes on moment generating functions.

Due date: Thursday September 13

Problems:

1) Let X be a discrete random variable with values in $\{0, 1, 2, \ldots, n\}$, and let $g(t) = M_X(t)$ be its mgf. Find in terms of G the mgf's for the following:
(a) $-X$
(b) $X + 1$
(c) $3X$
(d) $aX + b$

2) The discrete r.v. X has the distribution

$$P(X = k) = \frac{1}{e\,k!} \quad k = 0, 1, 2, \ldots$$

Find the mgf of X, and use it to calculate the mean and standard deviation of X.

3) The continuous r.v. X has the distribution (pdf)

$$f_X(x) = 9\,x\,e^{-3x}, \quad x \geq 0$$

Find the mgf of X and use it to calculate the mean and standard deviation of X.

4) The mgf for the χ^2 distribution with n degrees of freedom is $(1 - 2t)^{-n/2}$. Suppose that X and Y are independent χ^2 distributions each with 5 degrees of freedom. Let $W = X + Y$ and $V = X - Y$.
(a) Find the mgf of W.
(b) Is W a χ^2 distribution? If so, give the degrees of freedom.
(c) Find the mgf of V.
(d) Is V a χ^2 distribution? If so, give the degrees of freedom.