

(*): Assigned to weekly problem set.

MGFs

1. Suppose that X and Y are two iid random variables with MGF $M(t) = e^{t^2+3t}$ for $-\infty < t < \infty$. Find the MGF of the random variable $Z = 2X - 3Y + 4$. Don't forget to specify where it is finite.
2. (*) Suppose X is a discrete random variable with PMF

$$f_X(k) = P(X = k) = c \frac{p^k}{k}, \quad k = 1, 2, 3, \dots$$

where $p \in (0, 1)$ and c is some constant that does not depend on k .

- a) Use the Taylor series for $\log(1 - x)$ to find the value of c .
 - b) Compute the mean of X .
3. (*) The *Laplace distribution* has PDF

$$f_X(x) = \frac{1}{2}e^{-|x|}, \quad -\infty < x < \infty$$

Find the MGF of the Laplace distribution. Don't forget to define where it exists.