

CS 333202: Probability and Statistics
HW12 Part II

1. Let X be a discrete random variable with probability mass function $p(i) = 1/5, i = 1, 2, \dots, 5$, zero elsewhere. Find $M_X(t)$.
2. (a) Find $M_X(t)$, the moment-generating function of a Poisson random variable X with parameter λ .
Hint: $\sum_{x=0}^{\infty} \frac{a^x}{x!} = e^a$
(b) Use $M_X(t)$ to find $E(X)$ and $\text{Var}(X)$.
(c) Suppose that the moment generating function of a random variable X is given by $M(t) = e^{3(e^t-1)}$. What is $P(X = 0)$?
3. Let X be a discrete random variable with the probability mass function

$$p(i) = 2\left(\frac{1}{3}\right)^i, \quad i = 1, 2, 3, \dots; \quad \text{zero elsewhere.}$$

Find $M_X(t)$ and $E(X)$.

Hint: Note that the condition that $M_X(t)$ be finite in some interval is an important requirement. Without this condition some moments of X may not exist.