

MA 519 Fall 2016 (Aaron N. K. Yip)

Homework 3

Due: Thursday, Oct. 6, in class

Ross, 9th edition:

Chapter 4

Problems: #4, 21, 22, 36, 37, 42, 43

Theoretical Exercises: #4, 5, 10, 13, 14, 18, 25, 27, 30, 32, 34

Self-Test Problems: #4

Additional Problems:

1. Let X be a positive-integer-valued random variable, i.e. X takes values in $\{1, 2, 3, \dots\}$. Suppose the distribution of X satisfies the following: for all m, n , it holds that

$$P(X > m+n | X > m) = P(X > n), \text{ or equivalently } P(X > m)P(X > n) = P(X > m+n).$$

(The above property is called the *memoryless property*.)

Show that X must be a geometric random variable, i.e. there exists a p ($0 < p < 1$) such that for all n

$$P(X = n) = (1 - p)^{n-1}p.$$

(Combined with what is shown in class, you will have actually proved that a positive-integer-valued random variable is geometric *if and only if* it satisfies the memoryless property.)