HW 5-1 (Due Oct. 04, 2016) **Name:**

Print then work on it directly. Staple HW 5-1 and 5-2 together.

Problem 0 Redo the problems that you did not correctly solve in Exam 1.

Problem 1 Prove that:

GEOMETRIC MGF: Suppose that $Y \sim \text{geom}(p)$. The mgf of Y is given by

$$m_Y(t) = \frac{pe^t}{1 - qe^t},$$

where $q = 1 - p$, for $t < -\ln q$.

Problem 2

3.71 Let Y denote a geometric random variable with probability of success p.

a Show that for a positive integer a,

$$P(Y > a) = q^a.$$

b Show that for positive integers a and b,

$$P(Y > a + b | Y > a) = q^b = P(Y > b).$$

This result implies that, for example, $P(Y > 7|Y > 2) = P(Y > 5)$. Why do you think this property is called the *memoryless* property of the geometric distribution?

where $q = 1 - p$.

Problem 3

3.67 Suppose that 30% of the applicants for a certain industrial job possess advanced training in computer programming. Applicants are interviewed sequentially and are selected at random from the pool. Find the probability that the first applicant with advanced training in programming is found on the fifth interview.

3.68 Refer to Exercise 3.67. What is the expected number of applicants who need to be interviewed in order to find the first one with advanced training?

Problem 4

3.78 If Y has a geometric distribution with success probability .3, what is the largest value, y_0, such that $P(Y > y_0) \geq .1$?

Problem 5

3.77 If Y has a geometric distribution with success probability p, show that

$$P(Y = \text{ an odd integer }) = \frac{p}{1 - q^2}.$$

Problem 6

3.76 Of a population of consumers, 60% are reputed to prefer a particular brand, A, of toothpaste. If a group of randomly selected consumers is interviewed, what is the probability that exactly five people have to be interviewed to encounter the first consumer who prefers brand A? At least five people?