451/551 - Exercise on Ch. 3

Not Due

1. Let Y be a random variable with pmf given in a table below. Find $E(Y)$, $E(1/Y)$, $E(Y^2-1)$, and $V(Y)$.

y	1	2	3	4
$p(y)$	.2	.1	.4	.3

2. A study is being conducted in which the health of two independent groups of ten policyholders is being monitored over a one-year period of time. Individual participants in the study drop out before the end of the study with probability 0.2 (independently of the other participants). What is the probability that at least 9 participants complete the study in one of the two groups, but not in both groups?

3. Suppose in a large body students, 20% of them are internatioal students. When a student council of 10 students are randomly selected, what is the probability that international students are under-represented in the council (1 or 0 int. stu.)?

4. Ten percent of the parts manufactured on an assembly line are defective. Parts are tested at the end of the line, and if defective, it will be labeled and set aside. The assembly line will be stopped for inspection when 10 defective parts have been found in a day. If new parts are assembled every 7 min, what is the probability the line will be stopped on or before 8 hours?

5. The number of power surges in an electric grid has a Poisson distribution with a mean of 1 power surge every 12 hours. What is the probability that there will be no more than 1 power surge in a 24-hour period?

6. A box contains 35 gems, of which 10 are real diamonds and 25 are fake diamonds. Gems are randomly taken out of the box, one at a time without replacement. What is the probability that exactly 2 fakes are selected before the second real diamond is selected?

7. A hospital receives 1/5 of its flu vaccine shipments from Company X and the remainder of its shipments from other companies. Each shipment contains a very large number of vaccine vials. For Company X's shipments, 10% of the vials are ineffective. For every other company, 2% of the vials are ineffective. The hospital tests 30 randomly selected

vials from a shipment and finds that one vial is ineffective. What is the probability that this shipment came from Company X?

8. Let X be a random variable with moment generating function

$$M(t) = (\frac{2 + e^t}{3})^9.$$

Calculate the variance of X.