

## MATH 262

### Review Problems

Day 26

- An interviewer is given a long list of people that she can interview. When asked, suppose that each person independently agrees to be interviewed with probability 0.45. The interviewer must conduct ten interviews. Let  $X$  be the number of people she must ask to be interviewed in order to obtain ten interviews.
  - What is the probability that the interviewer will obtain ten interviews by asking no more than 18 people?
  - What are the expected value and variance of the number of people who *decline* to be interviewed before the interviewer finds ten who agree?
- Suppose that  $X \sim \text{Exp}(3)$ , and let  $Y = \lfloor X \rfloor$  denote the largest integer that is less than or equal to  $X$ . For example,  $\lfloor 2.1 \rfloor = 2$ ,  $\lfloor 5.99 \rfloor = 5$ , and  $\lfloor 14 \rfloor = 14$ .
  - Is  $Y$  a discrete or continuous random variable?
  - Find  $P(Y \leq 1)$ .
  - Find  $P(Y = 2)$ .
  - Can you generalize? What is  $P(Y = n)$ , for any positive integer  $n$ ? Is the distribution of  $Y$  one of the distributions that we have studied in this course?

3. Let  $X \sim \text{Geom}(p)$ . Find the expected value of  $\frac{1}{X}$ .

4. Let  $X \sim \text{Unif}[0, 1]$ . Compute the  $n$ th moment of  $X$  in two different ways.

(a) Use the formula  $E(X^n) = \int_0^1 x^n dx$ .

(b) Use the moment generating function  $M_X(t)$ .

★ **BONUS:**

- (a) Give an example of a random variable such that  $E(X)$  is undefined. (i.e.,  $E(X)$  diverges to  $\infty$ .)
- (b) Give an example of a random variable  $X$  such that  $E(X) < \infty$  and  $E(X^2)$  is undefined. (i.e.,  $E(X^2)$  diverges to  $\infty$ .)