STAT/MA 41600
In-Class Problem Set #18: September 26, 2018

1. Compute the value of the sum

$$\sum_{x=2}^{\infty} \frac{e^{-5}5^x}{x!}.$$

2. Suppose that $X_1, \ldots, X_{12}$ are independent Poisson random variables, each with mean 0.5. Define $X = X_1 + \cdots + X_{12}$.
2a. What is the mean of X?
2b. What is the variance of X?
2c. Find $P(X \leq 3)$.

3. In the Mathematics library, suppose that the number of errors in a book chapter (selected at random) is modelled by a Poisson random variable, with mean 2.8.
3a. Find the probability that such a randomly chosen book chapter has at most 4 errors.
3b. Find the conditional probability that such a randomly chosen book chapter has at most 3 errors, given that it has at most 5 errors.

4. Consider a collection of 3 million jelly beans. Suppose that each jelly bean has a 1 in a million chance of having a defect, and suppose that the potential for defects is independent, from jelly bean to jelly bean.
4a. Write an exact expression for the probability that there are 4 or fewer defects in the collection.
4b. Approximate the probability that there are 4 or fewer defects in the collection, and find the value of the probability, using this approximation.