

SM 316 – Spring 2019

Homework 4

Due: Monday 04 MAR 2019

PLEASE READ THE INSTRUCTIONS/SUGGESTIONS ON THE COURSE WEBPAGE. FOR ALL PROBLEMS, MAKE SURE TO DEFINE WHAT DISTRIBUTION YOU ARE USING AND USE CORRECT NOTATION.

Hand in the following problems:

1. A student must get at least three of the four problems on the exam correct to get an A. The student has been able to do 80% of the examples on old exams so they assume the probability to get any question correct is 0.8. Assume that the results on different problems are independent.
 - (a) What is the probability the student gets an A?
 - (b) If the student gets the first problem correct, what is the probability the student gets an A?
2. A certain area of the Midwest is, on average, hit by 6 tornados a year. Find the probability that in a given year that area will be hit by
 - (a) fewer than 4 tornados.
 - (b) anywhere from 6 to 8 tornados.
3. Let X be a continuous random variable with Uniform distribution on $(10,20)$ which represents the time, in years, that an electrical component fails.
 - (a) Find the probability the component will last more than 16 years given the component has lasted 12 years thus far.
 - (b) Find the cumulative distribution function $F(x)$.
 - (c) Use part b) to find the probability the component lasts less than 18 years.
4. The loaves of rye bread distributed to local stores by a certain bakery have an average length of 30 centimeters and a standard deviation of 2 centimeters. Assuming that the lengths are normally distributed, what percentage of the loaves are
 - (a) longer than 31.7 centimeters?
 - (b) between 29.3 and 33.5 centimeters in length?
 - (c) Are shorter than 25.5 centimeters?
 - (d) Is it possible to have positive probability for a negative length? Why or why not?
5. Let X be a normal random variable with mean 3 and variance 4.

- (a) Find the probability $P(2 < X < 6)$.
- (b) Find the value k such that $P(X > k) = 0.33$.
- (c) Find $E[X^2]$. (Hint: You can integrate with the density function, but it is quicker to relate $E[X^2]$ with the mean and variance)