MATH 241 Homework 8

Due: Sunday 4/25 11:59pm to Moodle

- Chapter 5 Problem 15

  If X is a normal random variable with parameters $\mu = 10$ and $\sigma^2 = 36$, compute

  (a) $P\{X > 5\}$;

  (b) $P\{4 < X < 16\}$;

  (c) $P\{X < 8\}$;

  (d) $P\{X < 20\}$;

  (e) $P\{X > 16\}$.

- Chapter 5 Problem 16

  The annual rainfall (in inches) in a certain region is normally distributed with $\mu = 40$ and $\sigma = 4$. What is the probability that starting with this year, it will take more than 10 years before a year occurs having a rainfall of more than 50 inches? What assumptions are you making?

- Chapter 5 Problem 18

  Suppose that X is a normal random variable with mean 5. If $P\{X > 9\} = 0.2$, approximately what is $Var(X)$?

- Chapter 5 Problem 20

  If 65 percent of the population of a large community is in favor of a proposed rise in school taxes, approximate the probability that a random sample of 100 people will contain

  (a) at least 50 who are in favor of the proposition;

  (b) between 60 and 70 inclusive who are in favor;

  (c) fewer than 75 in favor.

- Chapter 5 Problem 23

  One thousand independent rolls of a fair die will be made. Compute an approximation to the probability that the number 6 will appear between 150 and 200 times inclusively. If the number 6 appears exactly 200 times, find the probability that the number 5 will appear less than 150 times.

- Chapter 5 Problem 28

  Twelve percent of the population is left handed. Approximate the probability that there are at least 20 left-handers in a school fo 200 students. State your assumptions.

- Chapter 5 Problem 37

  If X is uniformly distributed over (-1, 1), find

  (a) $P\{|X| > \frac{1}{2}\}$;

  (b) the density function of the random variable $|X|$.

- Chapter 5 Problem 39

  If X is an exponential random variable with parameter $\lambda = 1$, compute the probability density function of the random variable Y defined by $Y = \log X$. Note that the pdf of an exponential random variable with rate $\lambda > 0$ is: $f(x) = \lambda e^{-\lambda x}, x > 0$.

- Chapter 5 Problem 40

  If X is uniformly distributed over (0, 1), find the density function of $Y = e^X$.

- Chapter 5 Theoretical exercise 13 (only part a and b)

  The median of a continuous random variable having distribution function F is that value m such that $F(m) = \frac{1}{2}$. That is, a random variable is just as likely to be larger than its median as it is to be smaller. Find the median of X if X is

  (a) uniformly distributed over (a, b);

  (b) normal with parameters μ, σ^2;

- Chapter 5 Theoretical exercise 29

  Let X be a continuous random variable having cumulative distribution function F. Define the random variable Y by $Y = F(X)$. Show that Y is uniformly distributed over (0, 1).

Optional: if you feel like more practice

These will not be graded, but you are welcome to discuss these with me during the office hour.

- Textbook Chapter 5 Problems: 17, 19, 21, 24-27, 29-30, 22, 41-42
- Textbook Chapter 5 Theoretical exercise: 9, 10, 12, 14, 15, 18, 27, 30-31