List of possible theoretical/conceptual questions for Midterm 1 Exam

Please note that this list is not exhaustive. You are recommended to read thoroughly from the lecture slides for full coverage.

Lecture 1

- 1. What is the difference between a population and a sample?
- 2. Distinguish between a parameter and a statistic.
- 3. What is the meaning of Statistical Inference?
- 4. What is the difference between a discrete random variable and a continuous random variable? Give an example of each.

Lecture 2a

- 1. What is a probability distribution?
- 2. What are the two fundamental rules of a probability distribution?
- 3. Why is the probability of any single value equal to zero for continuous random variables?
- 4. Describe the method of constructing a probability distribution for a continuous random variable. (Hint: rescaling the y-axis, adjusting interval width etc.)
- 5. What are the probability requirements of a probability density function of a continuous random variable?
- 6. What are the two defining measures of a normal distribution? How do changes in these measures affect the distribution?
- 7. What is the standardized normal distribution?
- 8. Define the notation z_A . How is it different from the notation $-z_A$?
- 9. What is the 68-95-99.7 rule? Use a diagram to illustrate your answer.

Lecture 3a

- 1. What is a Sampling Distribution? What is the purpose of Sampling Distributions?
- 2. Use bullet points to explain the construction of a Sampling Distribution.
- 3. What is the expected value and the standard deviation of the true Sampling Distribution of \bar{X} ?
- 4. Compare the standard deviation of a normally distributed continuous random variable X to the standard deviation of the mean of a normally distributed continuous random variable \overline{X} . Use a diagram to illustrate your explanation.
- 5. What is the Central Limit Theorem?
- 6. What is the standardization formula of a random variable *X* and what is the standardization formula of a random variable \overline{X} ?

Lecture 4

- 1. Name the two methods we use for statistical inferencing.
- 2. What is a point estimator? What are three possible reasons for not using a point estimator?
- 3. What is an interval estimator? What is the formula?
- 4. What is the meaning of confidence level?
- 5. What is unbiasedness of the sampling distribution \overline{X} ? Use a diagram to illustrate.
- 6. What is consistency of the sampling distribution \bar{X} ? Use a diagram to illustrate.

- 7. What is relative efficiency of the sampling distributions \overline{X} ? Use a diagram to illustrate.
- 8. Suppose the interval estimate of the mean for variable *X* has an LCL value of 35 and UCL value of 55 at 99% confidence. Interpret the meaning of this interval.
- 9. What are the disadvantages of a wide interval?
- 10. How does a change in standard deviation, confidence level and sample size affect the width of the confidence level, respectively?
- 11. What is the meaning of error of estimation? What is a bound on error of estimation?

Lecture 5a

- 1. Describe Type I and Type II errors using an example.
- Why do we use Type I error to identify the rejection region? Hint: because Type I error assumes the null hypothesis is true, and our testing procedure begins with the assumption that the null hypothesis is true.

Lecture 5b

1. What are the two underlying assumptions of p-value? What does it mean to get a small p-value?