ECO 204 (Section 1)
@EWU

Quiz-1
Spring - 2025

March 9, 2025

Name: ______________________________

Student ID: ______________________________

- *Please avoid all unethical behaviors (e.g., looking at others' solutions, asking others), as this will result in a grade of zero in the quiz.*
- *The exam is worth 12 points (which would be later 8% of the final grade), and total duration of the exam is 10 minutes.*

1. **True/False (6 points)** Write "T" if True and "F" if False.
   (a) (1 point) ___**F**___ Population is a subset of the sample and we do inference for the sample quantities.
   (b) (1 point) ___**T**___ The value of the estimator will change from sample to sample.
   (c) (1 point) ___**F**___ For a continuous random variable we can calculate the probability for any specific value.
   (d) (1 point) ___**F**___ For a discrete random variable we must need a density function.
   (e) (1 point) ___**F**___ Inferential Statistics is just explaining the data and we don't make any conclusion regarding the population.
   (f) (1 point) ___**T**___ For Bernoulli distribution we have only one parameter.

2. **Short Questions (6 points)**
   (a) (3 points) If we have random variable X that represents height (in feet) of the EWU students, how do you interpret, following quantities: $\mathbb{E}(X) = 4.5$ and $\mathbb{P}(4.5 < X < 6) = .60$

   Solution:

   If X is a random variable representing height of the EWU students, the the expected height $\mathbb{E}(X) = 4.5$ feet means average height of all EWU students is 4.5 feet. $\mathbb{P}(4.5 < X < 6) = .60$ means the probability that the height of a random students is between 4.5 and 6 feet is 0.60. More concretely this means, if we randomly select 100 students from EWU, then the height of the 60 students will fall between 4.5 and 6 feet (this is the classical interpretation of probability!)

   (b) (3 points) If we assume height is normally distributed then, then for a sample size of 6 students, propose an estimator for the population mean, then also assuming i.i.d. what is the distribution of the sample means.

   Solution:

   If we assume height is normally distributed, this means $X \sim \mathcal{N}(\mu, \sigma^2)$. In this case if our target parameter is the population mean $\mathbb{E}(X) = \mu$, then the sample mean $\overline{X}$ is a "good" estimator for the population mean. Note in this case, $\overline{X}$ is a random quantity.

   The theory suggests (in particular look at the Theorem 1.2 of Chapter 1), if the population is normal, then the sample mean $\overline{X}$ is also normally distributed, and $\overline{X} \sim \mathcal{N}(\mu, \frac{\sigma^2}{n})$.

   Since we know the population mean $\mathbb{E}(X) = \mu = 4.5$ and $\mathbb{V}(X) = \sigma^2 = 8$, in this case, $\overline{X} \sim \mathcal{N}(4.5, \frac{8}{6})$