Math 13 - Homework 10

Name: _____ **Class Number:** _____

1) Calculate the value of the test statistic, determine the p-value, interpret the result, and draw the curve of the sampling distribution.

- $H_0: \quad \mu = 50$
- $H_1: \quad \mu > 50$
- $\sigma = 5, n = 9, \bar{x} = 51, \alpha = 0.05$

2) Calculate the value of the test statistic, determine the p-value, interpret the result, and draw the curve of the sampling distribution.

- $H_0: \quad \mu = 50$
- $H_1: \quad \mu < 50$
- $\sigma = 15, n = 100, \bar{x} = 48, \alpha = 0.05$

3) A statistic practitioner formulated the following hypothesis:

- $H_0: \quad \mu = 200$
- $H_1: \quad \mu < 200$

and learned that $\bar{x} = 190, n = 9$, and $\sigma = 50$.

a. Compute the p-value of the test.
b. Repeat part a) with $\sigma = 30$
c. Repeat part a) with $\sigma = 10$
d. Discuss what happends to the value of the test statistic and its p-value when the standard deviation decreases.

4) You are using $H_0 : \mu = 100$ against $H_1 : \mu < 100$ based on a random sample of nine observations from a Normal population. The data give $\bar{x} = 98$ and $s = 3$. The value of t statistic is:

a. -6
b. -2
c. -98

5) A business student claims that, on average, an MBA student is required to prepare more than five cases per week. To examine the claim, a statistics professor asks a random sample of 10 MBA students to report the number of cases they prepare weekly. The results are exhibited here. Can the professor conclude at a 5% significance level that the claim is true, assuming that the number of classes is normally distributed with a standard deviation of 1.5?

2, 7, 4, 8, 9, 5, 11, 3, 7, 4

a. Verify that the sample mean $\bar{x} = 6$ cases per week.
b. State the null and alternative hypotheses.
c. Compute the test statistic
d. Compute the p-value
e. Make a conclusion

6) A statistics practitioner randomly sampled 10 observations and found $\bar{x} = 103$ and $s = 17$. Is there sufficient evidence at the 10% significance level to conclude that the population mean is less than 100?

a. State the null and alternative hypothesis
b. Compute the test statistic
c. What is the t-score associated to a 0.10 significance level with d.f. $= 9$?
d. What is the conclusion?

7) University bookstores order books for their instructors. The number of ordered copies matches the projected demand. However, at the end of the semester, the bookstore has too many copies on hand and must return them to the publisher. A bookstore has a policy that the proportion of books returned should be kept as small as possible. The average is supposed to be less than 10%. To see whether the policy is working, a random sample of book titles was drawn and the fraction of returned book is listed here. Can we infer at the 10% significance level that the mean proportion of returns is less than 10%?

4, 15, 11, 7, 5, 9, 4, 3, 5, 8

a. Compute the sample mean $\bar{x}$
b. Compute the sample standard deviation
c. State the null and alternative hypotheses
d. Calculate the test statistic
e. Make a conclusion

8) Cola makers test new recipes for loss of sweetness during storage. Trained testers rate the sweetness before and after storage. Here are the sweetness losses found by 10 tasters for one new cola recipe:

2.0, 0.4, 0.7, 2.0, -0.4, 2.2, -1.3, 1.2, 1.1, 2.3

Use the data to carry out a significance test, and see if there is good evidence that the cola lost sweetness. Show all the steps.