**IME 503 (Fall 20)- Lab #4**

**Test of hypothesis for the mean and variance; Power curve**

**Q1:** Using the following set of random data, determine if the true value of the population standard deviations is significantly smaller than 4.2 units. Do the analysis manually and verify the results by Minitab. Note that because of the sensitivity of scientific measurements in this case, you should be rather conservative in your decision analysis. Use P<0.05.

10.5, 8.8, 6.8, 12.4, 12.0, 9.9

What assumption did you make? On what basis?

**Q2:** The following set of random data is collected from a statistical population to test the hypothesis that the mean of the population is significantly different than 10 units.

10, 11, 7, 11, 5, 9, 7, 9, 7, 10

1. Test the above hypothesis for LOS =5%. Use an α-approach and compare it to a

p-approach (both manual and by Minitab). Comments?

1. What if the true population mean is 11 units? What kind of error is possible in your analysis? Compute the corresponding error probability.
2. What is the power of test to detect the true population mean to be 7, 8, 9, 11, 12, or 13 units? Plot the power curve for this model.
3. Verify the shape and magnitude of your power curve by using Minitab.
4. Did you have to make any assumption for solving this problem? Why and how?

**Q3:** The following set of random data is collected from a population with unknown shape.

20.5, 31.3, 18.7, 26.0, 17.9, 21.1

Do we have a significant evidence to reject the claim that µ≤ 20.0 units? How does your analysis handle the matter of unknown shape of the parent population?

Note that no LOS is provided for you. How would you professionally handle this matter?

**Q4:** A statistical population has been known not be exactly a normal distribution. It has a historical variance of 9 units2 and a perceived mean of 85 units. The analyst does his work non-scientifically and typically selects a random sample of size 36 to see if the population mean has decreased by simply following his arbitrary decision rule:

Reject H0: µ= 85 in favor of HA: µ< 85, if the sample mean is less than 84 units.

1. Determine the maximum level of type I error probability for his decision.
2. Compute and explain to him the power of test for his above decision rule if indeed the population mean has decreased to a value of 84 units.
3. Are there any other issues that you need to educate him about this problem? Explain.

**Q5:** We are testing to see if the historical population mean of 50 units has shifted to a value of 48 units. This statistical distribution is approximately normal with a variance of 16 units2.

What sample size is necessary to have a power of 0.80 to detect the above shift? What if the true mean is 47 units? Assume LOS=0.07.