Practice Test for Statistics (Math 160), Exam 3

1) A class survey in a large class for 1st year college students asked, "about how many minutes do you study on a typical weekend?" The mean response of the 269 students was 137 minutes. Suppose that we know that the study time follows a Normal distribution with standard deviation of 65 minutes in the population of all first-year students at this university.

a) Use the survey to give a 99% confidence interval for the mean study time of all the first-year students.

b) What condition not yet mentioned is needed for your confidence interval to be valid?

c) For this problem, give an example how the condition in part (b) might not be satisfied.

2) To assess the accuracy of a laboratory scale, a standard weight known to 10 grams is weighed repeatedly. The scale readings are Normally distributed with unknown mean (if there were no random deviation, this mean would be 10 grams). The standard deviation of the scale readings is known to be .0002 grams.

a) Standard deviation is supposed to measure "spread." Qualitatively describe the spread of the weight's distribution.

b) The weight is weighed five times. The mean result is 10.0023 grams. Give a 98% confidence interval for the mean of repeated measurements of the weight.

c) How many measurements must be averaged to get a margin of error of plus or minus .0001 with 98% confidence?

d) Now suppose the true standard deviation is unknown, but we compute $s = .0002$ grams (the computed mean is still 10.0023 grams). Find a 98% confidence interval.

e) Your interval for part (d) should be larger than in part (b). Why?

3) Successful hotel managers must have personality characteristics often thought of as feminine as well as those often thought of as masculine. The Bem-Sex-Role Inventory (BSRI) is a personality test that gives separate ratings for female and male stereotypes, both on a scale of 1-7. A sample of 148 male general managers of three-star and four-star hotels had mean BSRI femininity score of $y=5.29^2$. The mean score for the general male population is mu = 5.19. Do hotel managers on the average differ significantly in femininity score from men in general? Assume that the standard deviation of scores in the population of all male hotel managers is the same as the adult male population of 0.78.

4) Sulfur compounds cause "off-odors" in wine, so winemakers want to know the odor threshold, the lowest concentration of a compound that the human nose can detect. The odor threshold for Dimethyl sulfide (DMS) in trained wine tasters is about 25 micrograms per liter of wine. The untrained noses of consumers may be less sensitive, however. The DMS odor thresholds for 10 untrained students are :

31 31 43 36 23 34 32 30 20 24

Assume that the odor threshold for untrained noses is Normally distributed with standard deviation of 7 micrograms per liter. Is there evidence that the mean threshold for untrained tasters is greater than 25 micrograms per liter?

5) A government report says that a 90% confidence interval for the mean income of American households is $59,067 with a margin of error of $356. Is the mean income significantly different from $59,000? (Multiple choice, explain your answer)

a) It is not significantly different as the 10% level and therefore is also not significantly different at the 5% level.
b) It is significantly different at the 10% level but might be significantly different at the 5% level.
c) It is significantly different at the 10% level.

True or False (explain your answer)

6) T F *z*-tests are strongly influenced by outliers.

7) T F If we would like to increase the power of a test, we should decrease the sample size.

8) T F If we increase α from .05 to .10, the power of a test will increase. (Hint: What is α?)

9) T F If the hypothesized mean is increased, the power of the test is decreased.

10) T F If we would like to increase the effect size which is practically significant, we should decrease the sample size.

11) Here are measurements in millimeters of a critical dimension for 16 auto engine crankshafts.

224.120	224.001	224.017	223.982	223.989	223.961
223.960	224.089	223.987	223.976	223.902	223.980
224.098	224.057	223.913	223.999		

The dimension is supposed to be 224 mm and the variability of the manufacturing process is unknown. Is there evidence that the mean dimension is not 224mm?

12) The Trial Urban District Assessment (TUDA) is a government sponsored study of student achievement in large urban school districts. TUDA gives a reading test scored from 0 to 500. A score of 243 is a basic reading level and a score of 281 is proficient. Scores for a random sample of 1470 eighth graders in Atlanta had a mean score of 240 with standard error of 1.1.

a) Give a 99% confidence interval for the mean score of all Atlanta eighth graders.

b) Is there good evidence that the mean for all Atlanta eighth graders is less than the basic level?