

## Homework 2

1. In each of the following situations, state an appropriate null hypothesis  $H_0$  and alternative hypothesis  $H_1$ . Be sure to identify the parameters that you use to state the hypotheses.
  - (a) An experiment on learning in animals measures how long it takes a mouse to find its way through a maze. The mean time is 18 seconds for one particular maze. A researcher thinks that a loud noise will cause the mice to complete the maze slower. She measures how long each of 10 mice takes with a noise as stimulus.
  - (b) A pharmaceutical company developed a new drug for certain type of cancer and the company believed that the drug can significantly increase patients survival time after surgery. The mean survival time after surgery is 16 months. The company selected 20 volunteers who had the surgery, treated them with the drug and records their survival time.
2. Determine if the following statements are true.
  - (a) P-value is the probability that the null hypothesis is true.
  - (b) P-value is the probability, computed assuming that  $H_0$  is true, that the test statistics will take a value at least as extreme as that actually observed.
  - (c) Standard normal distribution has fatter tail than student t-distribution.
3. The mean level of calcium in the blood in healthy young adults is about 9.5 milligrams per deciliter. A clinic in Boston measures the blood calcium level of 10 healthy pregnant women as follows.

9.09, 9.82, 9.58, 9.03, 10.48, 9.35, 9.85, 9.36, 9.64, 9.43.

Is this an indication that the mean calcium level in the population from which these women come differs from 9.5?

- (a) State the null hypothesis  $H_0$  and and the alternative hypothesis  $H_1$ .
- (b) Calculate the mean and standard deviation of the blood calcium level of the 10 women.
- (c) Is the normal distribution a reasonable assumption for these data?
- (d) Calculate the z-score and perform the z-test based on the z-score. What is the P-value?
- (e) Calculate the t-statistic and perform the t-test. What is the P-value? What is the degree of freedom of this t-test?