

PID: _____

Last Name, First Name: _____

Section: _____

Homework 4
Math 183, UCSD, Fall 2017
Due on Friday 3rd, November 12:50pm
Staple pages together

Exercise 1

1. Suppose $H_0: \mu = 0$ is rejected in favor of $H_A: \mu \neq 0$ at the $\alpha = 0.05$ level of significance. Would H_0 necessarily be rejected at the $\alpha = 0.01$ level of significance? Explain.

2. Suppose $H_0: \mu = 0$ is rejected in favor of $H_A: \mu \neq 0$ at the $\alpha = 0.01$ level of significance. Would H_0 necessarily be rejected at the $\alpha = 0.05$ level of significance? Explain.

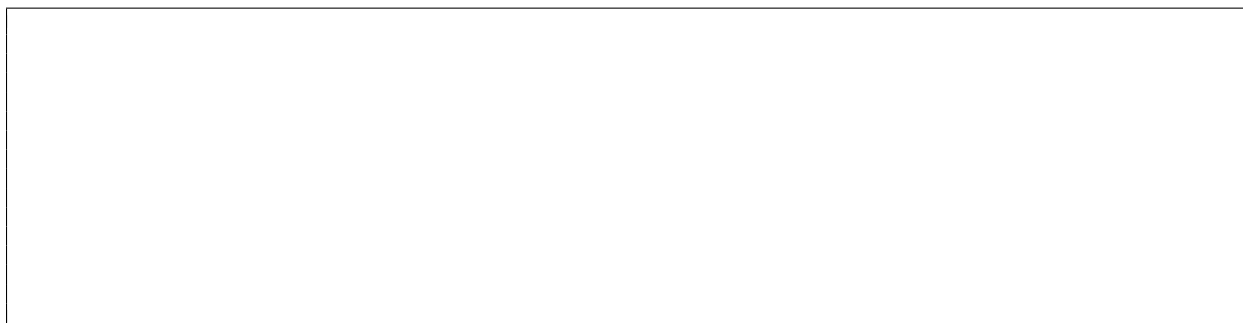
Exercise 2

Let X be a random variable with standard normal distribution. For what values of z are the following statements true? In each case, draw a picture illustrating the probability which is considered. (For practicing future exams, it is recommended you use z -tables)

1. $P(X \leq z) = 0.33$



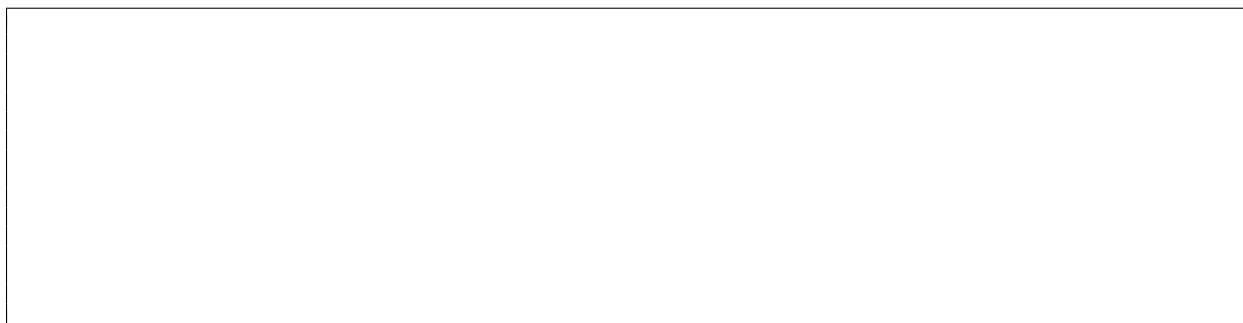
2. $P(X > z) = 0.2236$



3. $P(-1 \leq X \leq z) = 0.5004$



4. $P(-z < X < z) = 0.40$

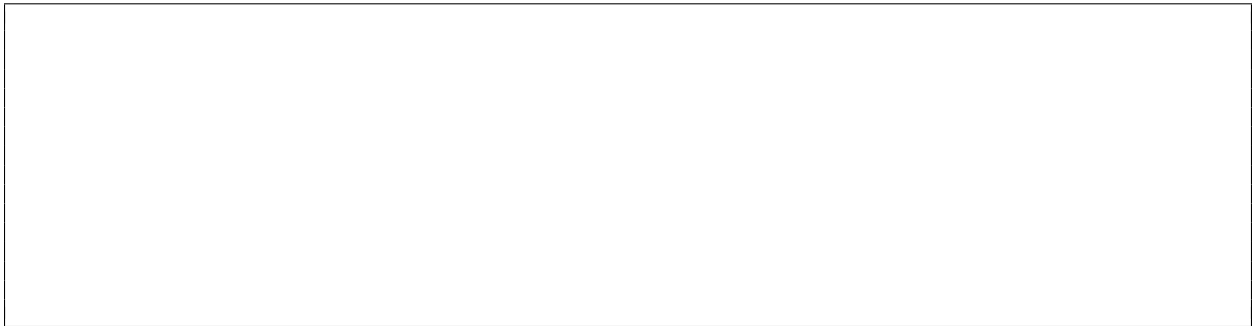


5. $P(z \leq X \leq 2.03) = 0.15$




Let Y be normally distributed, with mean $E(Y) = 0.5$ and standard deviation $SD(Y) = 1.5$. Compute the following probabilities. In each case, draw a picture illustrating the probability which is considered. (For practicing future exams, it is recommended you use z -tables)

6. $P(0.5 \leq Y \leq 3.4)$



7. $P(-0.46 \leq Y \leq 0.335)$



8. $P(Y \leq -2.995)$



Exercise 3

A poll conducted in 2013 found that 52% of U.S. adult Twitter users get at least some news on Twitter. The standard error for this estimate was 2.4%, and a normal distribution may be used to model the sample proportion.

1. Construct a 99% confidence interval for the fraction of U.S. adult Twitter users who get some news on Twitter.

2. Interpret this confidence interval in context.

Exercise 4

In the following setting, describe the decision rule and state your conclusion.

$$H_0: \mu = 120 \text{ versus } H_A: \mu \neq 120; \bar{x} = 114.2, n = 25, \sigma = 18, \alpha = 0.08$$

Exercise 5

Write the null and alternative hypotheses in words and using mathematical symbols for each of the following situations.

1. Minnesota residents are known to be taller than average US residents. In a local survey, a random sample of 33 Minnesota residents were measured. Do these data provide convincing evidence that the Minnesota resident average height is larger than the national 169.6cm average height?

2. In 2005 on an island (New Caledonian archipelago), all the rats of the were eradicated. To study rat's influence on the biodiversity of birds, two surveys were led: one in 2004, and one in 2009. Each study consists of the observation of biodiversity indicators (measured between 0 and 1) in 47 parcels, leading to $\bar{x}_{2004} = 0.21$ and $\bar{x}_{2009} = 0.20$. Do these data provide convincing evidence that rat has an influence on biodiversity of birds?

3. The so-called Mediterranean diet is pretty popular as a way to prevent heart diseases, since it supposedly reduces the cholesterol level. The cholesterol level of 74 randomly picked persons having Mediterranean diet is measured and compared to the average US level. Do these data provide convincing evidence that Mediterranean diet reduces cholesterol level?

Exercise 6

The following are thirty measurements made by the spectrophotometer of Homework 3, after a year of use. Although it has not broken down yet, it may be in need of recalibration. All thirty measurements of transmittance were made using a test sample on which a properly adjusted machine would give a reading of 12.6%.

12.3	12.7	13.6	12.7	12.9	12.6
12.6	13.1	12.6	13.1	12.7	12.5
13.2	12.8	12.4	12.6	12.4	12.4
13.1	12.9	13.3	12.6	12.6	12.7
13.1	12.4	12.4	13.1	12.4	12.9

1. Let μ denote the true average reading the spectrophotometer (in its current calibration state) would give for a sample with 12.6%. Assume that $\sigma = 0.4$. Build a Confidence interval of level for μ with significance level $\alpha = 0.03$.

2. Using mathematical symbols, write the null and alternative hypotheses that would help answering the question “Is the spectrophotometer well-calibrated?”.

3. Recalibrating the machine is long and boring. If you were asked to have a $\alpha = 0.03$ level of confidence in your decision, would you recommend that the machine be readjusted?