

Econ 103 – Quiz 5

Name: _____

Instructions: This is closed-book, closed-notes quiz. Please write your answers in the blanks provided. Each question is worth one point but no partial credit will be awarded. Non-programmable calculators are permitted.

1. True or false: a Type I error is when you fail to reject a null that is false

1. _____

2. Steve wants to test the null hypothesis that freshman students weigh on average 170 pounds against the two-sided alternative. Write down the null hypothesis and alternative hypothesis, where μ is the true average weight in the population.

2. _____

3. Following on from the previous question, to test this hypothesis Steve gathered data on 9 students. We assume that the weights collected come from a normal distribution: $X_1 \dots X_9 \sim iidN(\mu, \sigma^2)$. He calculates the sample mean weight, \bar{X} . We assume that he knows the variance σ^2 . Write down an expression for an appropriate test statistic if he wants to test the null hypothesis $\mu = \mu_0$.

3. _____

4. Suppose you are testing $\mu = \mu_0$ when $X_1, \dots, X_n \sim N(\mu, \sigma^2)$. Which of the following will be our rejection criterion if we are testing against the two sided alternative hypothesis $\mu \neq \mu_0$ with a significance level of α ?

1. $\left| \frac{\bar{X}_n - \mu_0}{\sigma/\sqrt{n}} \right| > \text{qnorm}(1 - \alpha/2).$

2. $\frac{\bar{X}_n - \mu_0}{\sigma/\sqrt{n}} > \text{qnorm}(\alpha).$

3. $\frac{\bar{X}_n - \mu_0}{\sigma/\sqrt{n}} < \text{qnorm}(1 - \alpha).$

4. $\frac{\bar{X}_n - \mu_0}{\sigma/\sqrt{n}} > \text{qnorm}(\alpha/2).$

4. _____

5. Which of the following is true about p values?

a. The p value gives the probability that the null hypothesis is true.

b. The p value is the probability under the null hypothesis of observing a test statistic at least as aberrant as the one actually obtained.

c. The p value gives us reliable results in the sense that, if we could repeat the experiment a great number of times, we would obtain a significant results on 100

% of those occasions.

d. The p value can be used to disprove the null hypothesis.

5. _____

6. Suppose that we observe a sample proportion of $\hat{p} = 0.6$ with a sample size of 100 and want to test $H_0: p = 0.5$ against the one-sided alternative that $p < 0.5$ at the 5% significance level. Calculate the value of the test statistic, fully imposing the null (i.e. using the value of p from our null hypothesis wherever possible)?

6. _____

7. Following on from the previous question, should we reject the null hypothesis?

7. _____

8. Kevin and Sara poll a random sample of 100 Penn Undergraduates to find out the proportion who prefer Coke to Pepsi. Unbeknownst to them, the true proportion is exactly 65%. Using the *exact same* dataset, both Kevin and Sara carry out two-sided hypothesis tests of the null hypothesis $H_0: p = 0.5$. Whereas Sara uses a 5% significance level for her test, Kevin uses a 1% significance level. Whose test has more power?

A. Kevin's Test B. Sara's Test C. Both have Equal Power D. Not Enough Information to Determine

8. _____