MATH 140 **Name** _____ **Date:**

Worksheet: Using `t.test()` in R

1. We want to conduct a 1-sample test of hypothesis:

$$H_o : \mu = 55 \quad \text{vs} \quad H_a : \mu \neq 55$$

at the significance level $\alpha = 0.05$. We gather a sample of size $n = 30$. See the associated web page (activities and labs tab of our course resource page) for the data. Enter this data into R, then use the `t.test()` to run the appropriate test of significance. Use the results of this test to answer the following questions:

   (a) What is the test statistic for these data?

   (b) What is the P-value for these data?

   (c) What is the 95% confidence interval for μ based on these data?

   (d) What is the conclusion of your hypothesis test? Do you reject the null hypothesis that $\mu = 55$ in favor of the alternative that $\mu \neq 55$?

2. We want to test at the $\alpha = .01$ level whether two population means are equal vs the alternative that they are not. We draw a sample of size 15 from one population and a sample of size 20 from a second population. See the associated web page for the data. Enter this data into R, then use the `t.test()` to run the appropriate test of significance. Use the results of this test to answer the following questions:

   (a) What is the test statistic for these data?

   (b) What is the P-value for these data?

   (c) What is the 99% confidence interval for μ based on these data?

   (d) What is the conclusion of your hypothesis test? Do you reject the null hypothesis that $\mu_1 - \mu_2 = 0$ in favor of the alternative that $\mu_1 - \mu_2 \neq 0$?

3. We want to conduct a matched pairs test of hypotheses:

$$H_o : \mu_{\text{diff}} = 0 \text{ vs } H_a : \mu_{\text{diff}} > 0.$$

at the $\alpha = .05$ level where μ_{diff} is the average difference in test-scores for students before and after a learning module. The null hypothesis is that the difference in scores is 0, and the alternative is that the difference is positive (suggesting post test scores are higher than pre-test scores). We have 12 paired sample points from a pre-test and a post-test for 12 students. See the associated web site for the data, where the variable $y1$ records the pre-test scores and $y2$ records the post-test scores. Enter these scores as vectors in R, then use the `t.test()` to run a matched pairs test on the differences $y2 - y1$. Use the results of this test to answer the following questions:

(a) What is the test statistic for these data?

(b) What is the P-value for these data?

(c) What is the 95% confidence interval for μ based on these data?

(d) What is the conclusion of your hypothesis test? Do you reject the null hypothesis that $\mu_{\text{diff}} = 0$ in favor of the alternative that $\mu_{\text{diff}} > 0$?