MT 143, Quiz #12, Spring 2020 Name _____

**Instructions**: Show all work. Answers without work can only be graded all or nothing. Partial credit is available only when work is shown. Answer all parts of each problem. Provide explanations as indicated. You may use Minitab or any other statistical software (such as a calculator or Excel) to complete any required statistical calculations or graphs.

1. Use the data in the table below to conduct a paired-t test to determine if mnemonic training improved scores. Clearly state the null and alternative hypotheses, test-statistic, p-value and your conclusion.

| Before mnemonic training | After mnemonic training |
|---|---|
| 204 | 223 |
| 393 | 412 |
| 391 | 402 |
| 265 | 285 |
| 326 | 353 |
| 220 | 243 |
| 423 | 443 |
| 342 | 340 |
| 480 | 582 |
| 464 | 490 |

**Test**

Null hypothesis $H_0$: μ_difference = 0
Alternative hypothesis $H_1$: μ_difference < 0

| T-Value | P-Value |
|---|---|
| -3.01 | 0.007 |

There is sufficient evidence to think the training did improve score.

2. Explain how the confidence level for a confidence interval is related to the significance level of a hypothesis test.

If the significance level is $\alpha$, the confidence level is $1 - \alpha$. They are complements of each other.

3. For the test in #1, describe in context the meaning of a Type II error.

A Type II error would occur when the training does actually improve scores, but based on the sample, we conclude that it does not.

4. Why are extremely large sample sizes potentially problematic? In explaining, be sure to include the difference between statistical significance and colloquial/everyday meanings of significance.

Statistical significance refers to the probability, not the size or magnitude of the difference. If you have a very large sample, then even very small differences can be statistically unlikely, but not be practically meaningful in the real world.