# Exam #3

Math 114-B

Thursday, May 6, 1999

For full credit, show all of your work. Do not round your answers too much. When performing significance tests, be sure to include the null hypothesis, the alternative hypothesis, the test statistic, the $p$-value, and your conclusion.

1. (a) Explain what a critical value is.
   (b) Find the critical value $z_*$ for a confidence level of 87%.
2. Explain how to interpret a $p$-value.
3. Test whether $\mu = 5$ or $\mu \neq 5$ at a 1% significance level, given that $\bar{x} = 4$, $s = 23$, and $n = 100$.
4. Explain the difference between a controlled experiment and an observational study. Give an example that we have not discussed in class of each.
5. Find a 95% confidence interval for the population proportion, given a sample of size 1000 with a sample proportion equal to 75%.
6. Find the sample size needed to find a 99% confidence interval with a margin of error that is at most 1.5%.
7. Explain what a margin of error is for a confidence interval.
8. Explain what a significance level is and what the effect of choosing a very small one is.
9. Explain what a test statistic is and how it is used.
10. Find a 97% confidence interval for the difference in population proportions if a sample from the first population has $\hat{p}_1 = 93\%$ with $n_1 = 200$, and a sample from the second population has $\hat{p}_2 = 87\%$ with $n_2 = 300$. Based on this confidence interval, is it likely that the population proportions are equal?