Math 121 **Test #3** **Fall 2009**

1. (15 pts) According to the Rasmussen polling organization, President Obama's total approval rating on Nov. 19 was 46%[1]. This was based on a survey of 1500 likely voters. Naturally, the president would like to believe that the majority (at least 50%) of Americans approve of his performance. However, can one conclude, at the 1% significance level, that *less* than 50% of likely voters approve of the president's performance? Test the hypothesis, showing all steps.

2. (10 pts) Using the data of the previous problem,

   (a) Find a 95% confidence interval for the president's approval rate.

   (b) What is the margin of error in your estimate in part (a)?

3. (15 pts) The Rasmussen Daily Presidential Tracking Poll[2] on Nov. 19 showed that the president's strong-disapproval rating increased from 38% to 41% over the previous two weeks, based on two samples, each of 1500 likely voters, one taken on Nov. 5 and the other on Nov. 19. Using a 5% significance level, test the hypothesis that the president's strong-disapproval rating has indeed increased during those two weeks.

4. (12 pts) Find the following probabilities concerning t.

   (a) $P(-4 < t_1 < 4)$

   (b) $P(t_{10} > 1.5)$

   (c) $P(t_{20} > 1.5)$

5. (12 pts) In each of the following situations, tell whether the test statistic should be z or t.

   (a) A test concerning the proportion of adult Americans in favor of the "public option" in federal health-care reform. Sample size is 500.

   (b) A test of the average high temperature on July 4 at a rural location. Data are available for the past 15 years. They appear to have a normal distribution.

   (c) The same test as in part (b), except that σ is assumed to be 8.5, i.e., "known" to be 8.5.

   (d) The same test as in part (b), except that the data are available for the past 50 years.

[1] `http://www.rasmussenreports.com/public_content/politics/obama_administration/daily_presidential_tracking_poll`

[2] Ibid

6. (15 pts) According to the National Interagency Fire Center, a federal agency, the average number of acres burned in wildfires over the past 49 years (measured in millions of acres) is 4.17, with a standard deviation of 2.15[3]. In 2006, a record number of 9.87 million acres were burned, although in 2008, the figure was much lower: 5.29 million acres, but still above the 49-year average. Test the hypothesis that the average number of acres burned annually is less than 5 million. Use a 5% level of significance.

7. (6 pts) Use the data of the previous problem to find a 90% confidence interval for the average number of acres burned annually in wildfires.

8. (15 pts) Suppose that a family's monthly electric bill during the 12 months prior to installing energy-efficient windows had averaged $135, with a standard deviation of $12. During the 12 months after installing the new windows, their monthly electric bill averaged $127, with a standard deviation of $10. Both samples appear to have normal distributions. (The electric rates were unchanged during the 24 months.) Test the hypothesis at the 5% significance level that the average monthly electric bill is lower after installing the new windows than it was before installing them. (Treat each 12-month period as a sample.)

[3] `http://www.nifc.gov/fire_info/fires_acres.htm`