

**Math 498****Quiz 5**

You should use the inside front and back covers of the textbook as a cheat sheet. You also should use the tables in the back of the textbook.

Justify all answers with neat and organized work. Clearly indicate your answers. 40 points possible.

For each problem, there is a blank hypothesis testing form on the next page.

1. (10 pts.) Patients with chronic fatigue syndrome were tested, then retested after being treated with fludrocortisone. Listed below are the changes in fatigue after the treatment (based on data from “The Relationship Between Neurally Medicated Hypotension and the Chronic Fatigue Syndrome” by BouHoloigah, Rowe, Kan, and Calkins, *Journal of the American Medical Association*, Vol. 274, No. 12). A standard scale from  $-7$  to  $+7$  was used, with positive values representing improvements. Use  $\alpha = 0.01$  to test the claim that the mean change is positive. Is there evidence that the treatment is effective?

6 5 0 5 6 7 3 3 2 6 5 5 0 6 3 4 3 7 0 4 4

2. (10 pts.) Samples of 21 filtered kingsize cigarettes and 8 nonfiltered kingsize cigarettes were measured for nicotine contents. The filtered kings were found to have a mean nicotine content of 0.94 milligrams with a standard deviation of 0.31 milligrams. The nonfiltered kings were determined to have a mean nicotine content of 1.65 milligrams with a standard deviation of 0.16 milligrams. Use a 0.05 significance level to test the claim that the filtered and nonfiltered kings have different variances with respect to nicotine content.

3. (10 pts.) It is a common belief that more fatal car crashes occur on certain days of the week, such as Friday or Saturday. A sample of motor vehicle deaths for a recent year in Montana is randomly selected (based on data from the Insurance Institute for Highway Safety). The numbers of fatalities for the different days of the week are listed in the accompanying table. At the  $\alpha = 0.05$  level of significance, test the claim that accidents occur with equal frequency on the different days.

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Number of fatalities	31	20	20	22	22	29	36

4. (10 pts.) Consider a random variable  $X$  with p.d.f.  $f(x) = 0.0008x$  for  $0 \leq x \leq 50$  and c.d.f.  $F(t) = P(X \leq t) = 0.0004t^2$  for  $0 \leq x \leq 50$ . A computer program is written, and it is hoped that it will generate random numbers following this distribution. A sample of 30 numbers is generated (shown below). At a significance level of 0.05, use the data to test  $H_0$ : “the numbers come from a population with p.d.f.  $f(x) = 0.0008x$  for  $0 \leq x \leq 50$ ” versus  $H_1$ : “not so.” Use  $k = 4$  classes of equal probability.

31 16 38 47 47 48 6 32 46 18  
 24 11 9 20 23 6 26 29 37 30  
 30 30 47 34 32 27 49 44 49 24