Practice Final

The following is a list of problems I consider final-worthy. This list of problems should serve as a good place to start studying, and it should not be considered a comprehensive list of problems from the sections we've covered. YOU are responsible for studying all the sections to be covered on the final.

Note: These problems concentrate on material since the last exam. To review earlier material, use the review problems distributed for the first two exams, as well as the exams themselves.

1. A single observation of a random variable having a uniform density with $\alpha = 0$ is used to test the null hypothesis $\beta = \beta_0$ against the alternative hypothesis $\beta = \beta_0 + 2$. If the null hypothesis is rejected if and only if the random variable takes on a value greater than $\beta_0 + 1$, find the probabilities of type I and type II errors.
2. For large n, the sampling distribution of S is sometimes approximated with a normal distribution having mean σ and variance $\frac{\sigma^2}{2n}$. Show that this approximation leads to the following $(1-\alpha)100\%$ confidence interval for σ:
$$\frac{s}{1+\frac{z_{\alpha/2}}{\sqrt{2n}}} < \sigma < \frac{s}{1-\frac{z_{\alpha/2}}{\sqrt{2n}}}.$$
3. A random sample of size n from an exponential population is used to test the null hypothesis $\theta = \theta_0$ against the alternative hypothesis $\theta = \theta_1 < \theta_0$. Use the Neyman–Pearson lemma to find the form of a most powerful critical region.
4. A random sample of size n from an exponential population is used to test the null hypothesis $\theta = \theta_0$ against the alternative hypothesis $\theta \neq \theta_0$. Find the corresponding critical region using the likelihood ratio test.
5. Given a random sample of size n from a uniform population with $\alpha = 3$, use the method of moments to obtain a formula for estimating the parameter β.
6. The data in Example 16.5 represents the weights in pounds both before and after a diet for a group of 16 individuals. Use the paired sign test to test at the 0.05 level of significance whether the weight-reducing diet is effective.
7. Suppose that it is known from experience that the standard deviation of the weight of 12-ounce packages of cookies is 0.25 ounces. We wish to check whether the true average weight of the packages is 12 ounces. 25 packages are selected at random and their mean is found to be 12.075. Test the null hypothesis $\mu = 12$ against the alternative $\mu \neq 12$ at the 0.01 level of significance by using a P-value, assuming the distribution of weights is normal.
8. If $x = 9$ of $n = 20$ patients suffered serious side effects from a new medication, test the null hypothesis $\theta = 0.50$ against the alternative $\theta \neq 0.50$ at the 0.05 level of significance. Here, θ represents the true proportion of patients suffering serious side effects from the new medication.
9. In a random sample, 147 out of 400 persons given a flu vaccine went on to develop the flu. Construct a 95% confidence interval for the true proportion of vaccinated individuals who will develop the flu.
10. The data in Example 16.4 represents the octane rating of a certain type of gasoline. Use the sign test at the 0.01 level of significance to test whether the mean octane rating is 98.5.