Your name(s):

Day 9: Hypothesis Testing
Sec 4.2-4.3

1. A sample of size 9 from a normal distribution with variance 25 is used to test the null hypothesis that the mean is 20 against the alternative hypothesis that the mean is not 20. Suppose that you decide to reject the null hypothesis if your sample mean is bigger than 25 or less than 15.

   (a) what is the probability of a type I error for your test?

   (b) if the true mean is actually 23, what is the probability of a type II error?

2. Before agreeing to purchase a large order of polyethylene sheaths for a particular type of high-pressure oil-filled submarine power cable, a company wants to see conclusive evidence that the population standard deviation of sheath thickness is less than 0.05mm. What hypotheses should be tested and why? Your book defines type I and type II errors in the context of means. In this context related to standard deviation, what are the type I and type II errors?

3. A random sample of $n = 12$ observations from a normal population produced the following estimates: $\bar{x} = 47.1$ and $s^2 = 4.7$.

   (a) Test the hypothesis $H_0 : \mu = 48$ versus $H_a : \mu \neq 48$ with $\alpha = 0.1$.

   (b) Find a 90% confidence interval for the mean, and interpret this interval.

4. Suppose 51 samples are taken in order to measure the percentage of titanium in an allow used in aerospace castings. The sample standard deviation is 0.37.

   (a) Test the hypothesis $H_0 : \sigma = 0.25$ versus $H_1 : \sigma \neq 0.25$ using $\alpha = 0.05$. State any necessary assumptions you are making.

   (b) Explain how you could do the above part by constructing a two-sided 95% CI for σ.

5. The paint used to make lines on roads must reflect enough light to be clearly visible at night. Let μ denote the true average reflectometer reading for a new type of paint under consideration. A test of $H_0 : \mu = 20$ versus $H_1 : \mu > 20$ will be based on a random sample of size n from a normal population distribution. What conclusion is appropriate in each of the following situations:

   (a) $n = 15, t = 3.2, \alpha = 0.05$.

   (b) $n = 9; t = 1.8, \alpha = 0.01$.

   (c) $n = 24; t = -0.2$.