

## **Chapter 4 – eXtra HW problems on Sample Size & Type II error**

**4.X2** In general, if we keep the level of confidence fixed, how much do you need to increase the sample size in order to cut the width of a confidence interval in half?

**4.X3** A researcher wanted to test the hypotheses  $H_0: \mu=38$  vs.  $H_a: \mu>38$  with  $\alpha=0.05$ . A random sample of 50 measurements from the population yielded a sample mean of 40.1. Assume that  $\sigma=5.6$  is known.

- (a) What conclusions can you make about the hypotheses based on the sample?
- (b) Could your conclusion to part (a) be a Type II error?
- (c) Calculate the probability of a Type II error if the actual value of  $\mu=39$ .

**4.X4** The administrator of a nursing home would like to do a time-and-motion study of staff time spent per day performing nonemergency tasks. Prior to the introduction of some efficiency measures, the average worker-hours per day spent on these tasks was  $\mu=16$ . The administrator wants to test whether the efficiency measures have reduced the value of  $\mu$ , assuming that  $\sigma=7.64$  is known. How many days must be sampled to test the proposed hypothesis if she wants to have  $\alpha=0.05$  and the probability of Type II error of at most 0.10 when the actual value of  $\mu=12$  hours?

**4.X5** A study was conducted of 90 adult male patients following a new treatment for congestive heart failure. One of the variables measured on the patients was the increase in capacity (in minutes) over a 4-week treatment period. The previous treatment regime had produced an average of  $\mu=2$  minutes. The researchers wanted to evaluate whether the new treatment had increased the value of  $\mu$  in comparison to the previous treatment, assuming that  $\sigma=1.05$  is known. The data yielded a sample mean of 2.17.

- (a) Using  $\alpha=0.05$ , what conclusion can you draw about the research hypothesis?
- (b) What is the probability of making a Type II error if the actual value of  $\mu=2.1$ ?