- (4 pts.) 1. Many companies are increasingly concerned about computer security and employees using their computers for personal use. A random sample of 50 employees of Liberty Mutual Insurance Company was asked whether they use the Internet for nonbusiness (personal) purposes during the day. The average number of hours that the employees used the Internet for personal reasons at work is $\overline{x} = 0.722$. Assume $\sigma = 0.5$ hours.
- (1 pt.) a) What assumptions are required so that you can construct a confidence interval?
- (1 pt.) b) Find a 95% confidence interval for the mean number of hours all employees at Liberty Mutual use the Internet for personal reasons.
- (1 pt.) c) Interpret your answer in part b).
- (1 pt.) d) The precision required for the student specifies that the margin of error (half-width) has to be 0.1 hours. How large a sample is necessary for this precision?
- (2 pts.) 2. After a ham is cured it may be smoked to add flavor or to ensure it lasts longer. Typical grocery-store hams are smoked for a short period of time, whereas gourmet hams are usually smoked for at least one month. A random sample of 36 grocery-store hams was obtained, and the length of the smoking time was recorded for each. The mean was $\overline{x} = 140$ hours. Assume $\sigma = 8$ hours.
- (1 pt.) a) What is the 99% upper bound of the mean amount of time a grocery-store ham is smoked.

(1 pt.) b) Interpret your bound.

- (6 pts.) 3. In many rural areas, newspaper carriers deliver morning papers using their automobiles because the length of the route prohibits walking. In a random sample of 28 carriers who use their automobiles, the sample mean route length was $\bar{x} = 16.7$ miles with s = 3.4.
- (2 pts.) a) If the distribution of route lengths is normal, find and interpret a 99% confidence interval for the true mean route length of newspaper carriers who use their automobiles.
- (3 pts.) b) If the mean length of the routes is over 20 miles, the circulation department becomes concerned that papers will not be delivered by 7:00 A.M. Perform a separate calculation to determine and interpret the minimum average distance is for these routes. is there any evidence to suggest the true mean route length is over 20 miles?
- (1 pt.) c) Determine the number of carriers that need to be sampled to ensure that the half-width of the interval in a) is at most 1.5 miles.
- (4 pts.) 4. A shadow chief secretary to the treasury claims that first-time home buyers in the South Downs area (near Worthing in Sussex, England) are paying (on average) more than £1367 in stamp duty. The shadow chief secretary believes this steep tax is prohibiting families from buying a first home in this area. A random sample of first-time home buyers will be obtained, and the stamp duty paid by each family will be recorded. These data will be used to determine whether there is any evidence the mean stamp duty for first-time home buyers is more than £1367.
- (1 pt.) a) State the null and alternative hypotheses.
- (1 pt.) b) In context, explain what the Type I error is.
- (1 pt.) c) In context, explain what the Type II error is.
- (1 pt.) d) Which one is worse, Type I error or Type II error, according to first-time home buyers?

- (4 pts.) 5. During the summer months, wildfires in the western United States pose a great hazard to people, residential and commercial buildings, and animals. Previous records indicate that the mean number of acres burned during a wildfire is 17,060. The most recent summer was unusually wet, and firefighting officials would like to know whether the mean number of acres burned during wildfires was any less. State the null and alternative hypotheses.
- (1 pt.) a) State the null and alternative hypotheses.
- (1 pt.) b) In context, explain what the Type I error is.
- (1 pt.) c) In context, explain what the Type II error is.
- (1 pt.) d) Which one is worse, Type I error or Type II error, in the respect for allocation of funds to fight wildfires? The amount of money is related to the mean number of acres burned. Please justify your answer.