Exercises: <u>Chapter 13</u>: 23 – 26, 28, 31, 32, 41, 43, 51, 54 (NOTE: In all cases do the calculations without using software and use the statistical tables provided on our course website: use approximation when necessary.)

Problems:

(1) Without doing any formal hypothesis testing, consider the hypotheses H_0: μ = -1 and H_1: μ > -1 and state what the conclusion would be in the following obvious cases. For simplicity, assume that the population is normal so we do not have to worry about a sufficiently large sample size.

   a. X-bar = -2, σ^2 = 36, n = 9
   b. X-bar = 200, σ^2 = 36, n = 9
   c. X-bar = 0, σ^2 = 1, n = 2500
   d. X-bar = -0.5, σ^2 = 100, n = 36

(2) Consider testing the following hypotheses H_0: μ = -1 and H_1: μ < -1 where the population variance is 4. For a sample size of 100 you obtain a standardized test statistic of -2. What is the point estimate of μ?

(3) A researcher wishes to make an inference about the difference between the average price in monopolized markets and competitive markets for retail gasoline. There are two research questions: (Q1) Do the data provide sufficient statistical support for the claim from basic microeconomic theory that less competition means higher prices for consumers? and (Q2) How big of a price premium do monopolists charge? The following data are available.

> 4 monopolized retail gasoline markets: 1.88 1.90 1.86 1.84
> mean: $1.87 per gallon; sd: $0.026 per gallon
>
> 8 comparable but competitive markets: 1.79 1.69 1.87 1.86 1.66 1.86 1.91 1.76
> mean: $1.80 per gallon; sd: $0.091 per gallon

(a) Which general method of statistical inference is most appropriate to address Q1? How about Q2? Explain in words. [This is a qualitative question not a quantitative one.]

(b) What kind of data are these? (cross-sectional, times series, panel) (observational, experimental, natural experiment) Explain.

(c) Draw a diagram like we did in Lecture 4 (with the boxes and arrows) for this example that illustrates the effect that we are interested in and any confounding (unobserved/lurking) variables.

(d) Using your diagram, explain why the presence or absence of a monopolist is an endogenous variable and how that will affect our inference regarding the research question.

(e) We choose "comparable" locations in an attempt to hold "other things equal" and hence to isolate the impact of monopolization. Explain how your answer to part (d) is related to the challenge of picking otherwise comparable locations when looking for monopolized and competitive markets to compare.

(f) [OPTIONAL] To carry out the formal hypothesis test of a difference between the means you need to study Chapter 14 (optional). Are prices higher, in a statistically significant way, in markets that are monopolized compared to competitive? Is this the same question as Q1?

(g) If we find that prices are significantly higher, can we conclude that monopolies cause higher prices? Carefully explain your answer.