1. **For your senior thesis, you polled your classmates, asking them, "How much would you be willing to pay to double the amount of parking on campus?" Based on their responses, you estimated that your fellow students were collectively willing to pay $12 million to double the amount of on-campus parking. What are some problems with this type of analysis?**

Survey willingness-to-pay figures can be suspect for several reasons. First, respondents may not have much experience with pricing this commodity, so they wouldn't have a good sense of what they really would be willing to pay if they actually had to pay for it. Second, respondents may have an incentive to either understate or overstate their true willingness to pay. They will understate it if they are concerned that the regents will raise their tuition to pay for the parking lot; they will overstate it if they want more parking but don't think they will actually have to pay for it. Third, you may need to consider your polled audience; if you had an unscientific sample, your results may be biased. For example, a senior polling his or her friends may have mostly asked students who will have graduated before the parking is expanded, and they may not place a high value on future parking. Or a dorm resident may have polled many students who do not drive and thus have little use for additional parking.

2. **The city of Metropolita added a new subway station in a neighborhood between two existing stations. After the station was built, the average house price increased by $10,000 and the average commute time fell by 15 minutes per day. Suppose that there is one commuter per household, that the average commuter works 5 days a week, 50 weeks a year, and that the benefits of reduced commuting time apply to current and future residents forever. Assume an interest rate of 5%. Produce an estimate of the average value of time for commuters based on this information.**

Letting V denote the value of an hour, the annual value of the time savings from the change can be written as (5 days/week × 50 weeks/year × .25 hours/day) × V, or 62.5 V per year. The present value of 62.5 V per year, forever, at a 5% discount rate, is 62.5 V / 0.05. The implication of the change in house prices is that households were willing to pay $10,000 to gain 15 minutes per commuting day, i.e., that the present value of the time savings is $10,000. Setting 62.5 V / 0.05 = $10,000 and solving gives V = $8.

3. **The city of Animaltown plans to build a new bridge across the river separating the two halves of the city for use by its residents. It is considering two plans for financing this bridge. Plan A calls for the bridge to be paid for out of tax revenues, allowing anyone to freely use the bridge. Plan B calls for imposing a toll of $6 for crossing the bridge, with the remainder of the cost to be paid out of tax revenues. City planners estimate a local demand curve for hourly use of the bridge to be Q = 1,800 – 100P. The bridge will be able to accommodate 2000 cars per hour without congestion. Which of the plans is more efficient, and why? How would your answer change if congestion was predicted on the bridge?**

At a price of \$6, the hourly use would be 1,800 – 100(6) = 1,200, well below the capacity of the bridge. If the bridge were free, hourly use would be 1,800. The consumer surplus triangle under Plan A would be ½ (18) × 1800 = 16,200, while under Plan B it would be lower, at ½ (18 – 6) × 1200 = 7200. Without congestion, the marginal cost of additional use of the bridge is presumably close to zero, this means that total surplus is higher under Plan A. Intuitively, the reason for this is simply that the efficient price of a good with zero marginal cost is zero—the bridge should be free if there is no marginal cost. If there was substantial congestion, there would be a positive social marginal cost of additional bridge use of the bridge, and Plan B might be more desirable.

4. **Jellystone National Park is located 10 minutes away from city A and 20 minutes away from city B. Cities A and B have 200,000 inhabitants each, and residents in both cities have the same income and preferences for national parks. Assume that the cost for an individual to go to a national park is represented by the cost of the time it takes her to get into the park. Also assume that the cost of time for individuals in cities A and B is \$.50 per minute. You observe that each inhabitant of city A goes to Jellystone ten times a year while each inhabitant of city B goes only five times a year. Assume the following: the only people who go to the park are the residents of cities A and B; the cost of running Jellystone is \$1,500,000 a year; and the social discount rate is 10%. Also assume that the park lasts forever.**

a. Compute the cost per visit to Jellystone for an inhabitant of each city.

A day at the park will cost a resident of city A \$10 (10 minutes each way × \$.50 per minute) and a resident of city B \$20 (20 minutes each way × \$.50 per minute).

b. Assuming that those two observations (cost per visit and number of visits per inhabitant of city A, and cost per visit and number of visits per inhabitant of city B) correspond to two points of the same linear individual demand curve for visits to Jellystone, derive that demand curve. What is the consumer surplus for inhabitants of each city? What is the total consumer surplus?

City A residents account for 2,000,000 visits at a price of \$10; city B residents account for 1,000,000 visits at a price of \$20. If the demand function is linear, every \$10 price increase is associated with a decrease in quantity of 1,000,000 visits. Thus, the demand function is Price = \$30 – 0.00001Q.

City A residents have a consumer surplus of ½ (2,000,000 × \$20) = \$20,000,000.

City B residents have a consumer surplus of ½ (1,000,000 × \$10) = \$5,000,000.

Total consumer surplus is \$25,000,000.

c. There is a timber developer who wants to buy Jellystone to run his business. He is offering \$100 million for the park. Should the park be sold?

Each year consumer surplus is \$25 million and operating costs are \$1.5 million, for a net benefit of \$23.5 million. Applying the social discount rate of 10% yields a PDV of \$235 million, much more than the timber developer’s offer. The park should not be sold.