MIDTERM EXAM

Instructions: The number in brackets (e.g., [5]) indicates the points for each question. Total: 90 points. Note that you also have 90 minutes to do the exam, so you should spend no more than 1 minute per point. Please Write Legibly. Briefly explain your answers (that is, don’t just write “yes” or “no” and don’t just write down a numerical answer without showing how you derived it). Write only on this exam.

Short answer questions
The following three questions require only short answers (1-3 sentences). Use any graphs that will help your explanation. Be sure to label graphs clearly.

1. [6] Do you think the introduction of cell phones made the demand for local telephone service delivered over land lines more or less elastic? Why?

   Some consumers see cell phones as a substitute for traditional local phone service, so the introduction of cell phones probably made the demand for local phone service more elastic.
2. In Fall 2004, Florida was hit by three hurricanes in quick succession, which wiped out much of the state’s tomato crop. As a result, the spot price in the U.S. wholesale market for tomatoes soared from $3 to $20 per pound, causing the retail price of tomatoes to increase dramatically as well. Many consumers of wholesale tomatoes changed their behavior as a result. For example, restaurants and cafeterias started serving salads without fresh tomatoes and supermarkets started stocking fewer fresh tomatoes.

a. [9] Does this indicate that there was shortage in the U.S. wholesale tomato market? Explain.

*There is shortage in a market when the quantity demanded exceeds the quantity supplied. The question describes a situation instead where there was a shock to the supply of wholesale tomatoes. This would be expected to shift the supply curve up and to the left, raising the equilibrium price of tomatoes, and reducing the equilibrium quantity. These are exactly the effects the question describes. The market would be in shortage only if buyers would like to buy more than is available at the going market price. In this case, buyers are able to buy as much as they like at the going market price, they just want to buy less than they did before the price rose.*

b. [9] Wal-Mart, the largest produce retailer in the U.S., has a unique purchasing strategy for wholesale tomatoes. It purchases all of its tomatoes under contracts with a subset of growers (assume for this question that none of Wal-Mart’s growers are in Florida). In other words, Wal-Mart’s growers have agreed to supply Wal-Mart on a pre-set schedule and have their shipments monitored using Wal-Mart’s tracking technology. In exchange, Wal-Mart agrees to pay its growers a set price, which they negotiate every spring for the year to come. In the spring of 2004, Wal-Mart had contracted with all of its growers to supply tomatoes at a price of $4 per pound, so this was the wholesale price Wal-Mart was paying in Fall 2004 after the hurricanes hit. What were Wal-Mart’s economic costs of selling the tomatoes at retail in Fall 2004? Would you expect Wal-Mart to charge a retail price significantly lower than $20 per pound? Explain your answers.

*Wal-Mart procured its tomatoes at a price that was much lower than the spot market price. Assuming that Wal-Mart could resell the tomatoes that it bought under contract at the spot market price, if it were to sell its own tomatoes at its retail stores, it would be forgoing the opportunity to sell them in the spot market. Therefore, recognizing the opportunity cost, Wal-Mart’s economic costs are $20 per pound, so it should not sell them at a price lower than $20 per pound.*
3. Nancy currently earns $100,000 per year. She is told that if she stays with her current firm, there is an 80% chance that she will be promoted next year to a position that would pay her a salary of $150,000. If she’s not promoted, her salary will remain at $100,000. She is also considering an offer from a new firm that would pay her an annual salary of $115,000 over the next two years. Assume that after the first two years, her salary will be the same whether she remains at her current firm or moves to the new firm. If Nancy decides to stay at her current firm, what can you conclude about her risk preferences in this instance? In other words, is her behavior consistent with risk aversion only? With risk neutrality only? With risk seeking only? With all three? Assume that all the salary figures are quoted in constant dollars, or in other words, ignore the time value of money in answering this question.

Nancy faces two options: (1) earn $230,000 for sure over the next two years, or (2) earn $200,000 with 20% probability and $250,000 with 80% probability. The expected value of option (2) is $240,000. Because she rejected option (1), we know Nancy’s certainty equivalent value for the gamble is greater than $230,000. This could mean that she is risk averse, risk neutral or risk seeking.

Decision tree question

Odessa Goodwyn is the editor and publisher of Bay Area Magazine, a monthly magazine about life in the Bay Area. A few months ago, she hired a freelance writer to do a story that profiled Bill Moore, a prominent local architect who recently designed the Museum of Post-Modern Art (MOPMA). The MOPMA design is hugely controversial—some Bay Area residents love its whimsical, post-modern styling while others see it as an ugly, over-priced monstrosity. The profile of Moore is now ready for publication, and rumors are swirling that Moore and his firm will be named as the chief architects for the planned Children’s Museum. News of the appointment could increase newsstand sales of Bay Area Magazine significantly. On the other hand, if another architect were named for the Children’s Museum job, Goodwyn worries that giving too much prominence to the Moore story could actually reduce sales since the magazine’s previous market research indicated that people who bought the Bay Area Magazine from newsstands were much more likely than others to feel antipathy towards Moore and his MOPMA design.
Goodwyn faces three choices about what to do with the article: she can feature the article as the cover story, run the story as a standard piece or drop the story entirely. Goodwyn calculates that if she runs the Moore story on the cover and Moore is appointed as the chief architect on the Children’s Museum project, net revenues for the month will be $2 million. If he isn’t appointed and they run the story on the cover, net revenues will be only $.5 million. If they run the story as a standard piece, she believes that net revenues will be $1 million if Moore is appointed and $.8 million if he is not. Finally, if she drops the story, she knows net revenues will be $.9 million in either case. She believes there is a 40% chance that Moore will be appointed.

a. [12] Draw Goodwyn’s decision tree and figure out whether or not she should run the story, and if so, whether she should run it as the cover story or as a standard piece. Assume that Goodwyn is an expected value maximizer.

See the attached tree. Goodwyn should run the story on the magazine’s cover.
b. [6] If Goodwyn were risk averse, might she have made a different decision than the one you found in part a? Why or why not?

Both of the alternatives that Goodwyn rejected—running the story as a standard story and dropping it altogether—yielded lower expected values, but they also involved less risk, and in the case of dropping the story altogether, no risk at all. A risk averse Goodwyn would never choose to run the story as a standard piece since it yields a lower expected value than dropping the story altogether and also involves some risk. She might opt to drop the story altogether.

c. [12] Assume that Goodwyn could learn for sure whether or not Moore would be appointed if she delayed publishing her magazine by four days. Delaying publication, however, would impose costs on the magazine since she would have to pay the typesetters and printers extra to get expedited service. How much should she be willing to pay for expedited service? In other words, what is the value of getting the information about whether or not Moore would be appointed before she decides how to run the Moore story? [Assume that Goodwyn is risk neutral, i.e. an expected value maximizer, for part c.]

If Goodwyn learns that Moore is appointed, she will run the cover story ($2m > 1m > .9m$). If she learns that he isn't appointed, she will opt to drop the story ($.9m > .8m > .5m$), so getting the information will change her decision in this case. By dropping the story rather than running it as a cover story, as she did in part a, Goodwyn earns $.4m more ($.9m - .5m$). She will only learn that he’s not appointed with 60% probability, so the information is worth $.6 \times $.4m = $.24m$. She should delay publication and pay for expedited service if it costs less than $240,000.
Market analysis question

You have been hired by the State of California to conduct an analysis of consumer demand for a potential high-speed rail line between San Francisco and Los Angeles. They have asked you to focus on the San Francisco to Los Angeles portion of the trip and to assume that all tickets are one-way. The line currently does not exist, but a market research firm carried out a survey of demand under several different pricing scenarios and determined that the daily demand would be:

\[ Q_D = 10,000 - 20p \]

where \( p \) is measured in dollars per trip and \( Q_D \) is measured in passenger trips.

a. [8] Following railroad operations in other parts of the world, the State of California is considering providing the train tracks to private companies, each of which could run its own trains from San Francisco to Los Angeles. Therefore, your boss asks you to assume that the perfectly competitive market assumptions hold, and to ignore scheduling problems and so on. He tells you that if there are many suppliers, he has estimated a daily supply curve of:

\[ Q_S = 15p + 900 \]

where \( p \) is measured in dollars per trip and \( Q_S \) is measured in passenger trips. He asks you to calculate the equilibrium price and quantity given this supply curve. What do you tell him?

The equilibrium is determined as the point where the demand and supply curves intersect \( (Q_D = Q_S) \), so that the quantity demanded is equal to the quantity supplied at a single price. Algebraically, set \( Q_D \) equal to \( Q_S \) and solve:

\[
10,000 - 20p = 15p + 900 \\
9,100 = 35p \\
p^* = $260
\]

To find the equilibrium quantity given this price, plug the equilibrium price into either the demand or the supply curve:

\[
Q^* = 15*260 + 900 = 4,800 \text{ (based on the supply curve)} \\
Q^* = 10,000 - 20*260 = 4,800 \text{ (based on the demand curve)}
\]
b. [5] What would be the consumer surplus at the equilibrium that you found in part a?

*Consumer surplus is the area under the demand curve but above the horizontal line at the level of the equilibrium price. It can be calculated in several ways. The easiest is simply to find the point on the demand curve where $Q_D = 0$ and manually solve for the area of the triangle. From the demand curve equation, at $Q_D = 0$:

\[ 0 = 10,000 - 20p \]
\[ p = 500 \]

so the triangle has a height of (500-260) = 240, and a length of 4,800 (the equilibrium supply). The area of the triangle, and the consumer surplus at the equilibrium price and quantity, is therefore .5 * 240 * 4,800 = $576,000.*
c. [7] As an alternative to opening the tracks to competition, the State of California is debating operating the trains themselves. They would like to maximize revenues along the line. Given the demand curve described at the beginning of the problem, calculate the revenue-maximizing price for a single train company serving the route. What is this price and how many tickets will be sold at this price?

Revenue will be maximized at the point where the price elasticity of demand is -1. We know the formula for the price elasticity of demand is $(dQ_D/dp) \cdot (p/Q_D)$. From the demand equation, $dQ_D/dp = -20$. Now we need to find a $p$ and $Q_D$ that are both on the demand curve and which, when plugged into the formula for the elasticity with this slope, equal –1. [Note: nearly full credit will be given if you articulated the logic up to this point but were unable to do the algebra to find the correct price.] We therefore have an algebraic system of 2 equations and 2 unknowns, and simply need to solve:

\[-20 \frac{p}{Q_D} = -1 \quad \text{(elasticity equation)}\]
\[\Rightarrow Q_D = 20p\]
\[Q_D = 10,000 - 20p \quad \text{(demand equation)}\]

Plugging the first equation into the second yields:

\[20p = 10,000 - 20p\]
\[40p = 10,000\]
\[p = 250\]

At this price, $Q_D = 10,000 - 20 \times 250 = 5,000$.
Note we could also obtain the quantity of 5,000 by using the elasticity relationship, i.e. $Q_D = 20 \times 250 = 5,000$. 

\[\]
d. [10] The market survey company comes back with more detailed data and tells you there are actually three separate customer segments in the market: businesspeople (B), leisure travelers (L), and students (S). You use their data to estimate three new, separate demand curves for these groups:

\[ Q_{DB} = 2000 - p \]
\[ Q_{DL} = 3400 - 4p \]
\[ Q_{DS} = 5500 - 20p \]

where \( Q_{DB} \) measures the passenger trips per day for businesspeople, \( Q_{DL} \) measures the passenger trips per day for leisure travelers, and \( Q_{DS} \) measures the passenger trips per day for students and \( p \) is the price per trip.

Your boss asks you to use this information to write a total market demand curve for him. What is the demand curve? Given this demand curve, what would be the total market demand at a price of $200? at $300?

The key to this question is to realize that the demand curves are additive only where they are positive. For the portion of each demand curve where demand is negative, actual demand by that segment is equal to zero, and you can’t simply add the curves together. Therefore the first step is to determine the cutoff points at which each segment’s demand goes to zero:

\[ Q_{DB} = 2000 - p \Rightarrow p = 2000 \text{ when } Q_{DB} = 0 \]
\[ Q_{DL} = 3400 - 4p \Rightarrow p = 3400/4 = 850 \text{ when } Q_{DL} = 0 \]
\[ Q_{DS} = 5500 - 20p \Rightarrow p = 5500/20 = 275 \text{ when } Q_{DS} = 0 \]

The total demand curve (denoted by \( T \)) is given by the sum of each demand curve when demand is positive. Therefore for prices less than 275, it is the sum of all three segments’ demand. For prices between 275 and 850 it is the sum of business and leisure travelers’ demand. For prices between 850 and 2000 it is the demand of the business segment only. For prices above 2000 total demand is zero. Algebraically:

\[ Q_{DT} = 10,900 - 25p \text{ when } p < 275 \]
\[ = 5400 - 5p \text{ when } 275 \geq p > 850 \]
\[ = 2000 - p \text{ when } 850 \geq p > 2000 \]
\[ = 0 \text{ when } p \geq 2000 \]

(Note that you can change all of the \( \geq \) to \( > \), and the \( > \) to \( \geq \), as long as you have the cutoff points right.)

When \( p = 200 \), the relevant portion of the demand curve is \( 10,900 - 25p \), so total demand is \( 10,900 - 25 \times 200 = 5,900 \).
When $p = 300$, the relevant portion of the demand curve is $5400 - 5p$, so total demand is $5400 - 5 \times 300 = 3900$. 
Moore is appointed [p=.4] 

Run as cover story

EV = 1.1 = .4*2 + .6*.5

Moore isn't appointed [p=.6]

.5

Run as standard story

EV = .8

Moore is appointed [p=.4]

1

Moore isn't appointed [p=.6]

.8

Don't run story

EV = .9

Moore is appointed [p=.4]

.9

Moore isn't appointed [p=.6]

.9