OLD EXAMS
MANAGERIAL ECONOMICS
(ECP 3703)

Spring 2010

CONTENTS

OLD MULTIPLE CHOICE EXAM QUESTIONS

Questions are arranged by topic from the class outline. Questions are numbered in reference to the original exam on which they appeared. I have given 25 exams with multiple choice or true false questions since I started teaching this course in this format. The first number indicates the exam and the second indicates the question number on the original exam. For example, 2.12 is exam 2 question 12, and, 6.3 is exam 6 question 3. There is a Key at the end of all the questions. They key is in the order in which the questions appeared on the original exams, not in the order they appear in this document, in which they have been rearranged by topical area.

WARNING
In almost all cases, there is one right answer, and, it is the one indicated in the key. BUT, in the process of combining all of these questions, ordering them by topic, and cleaning up the formatting, etc… it is possible that some error(s) slipped through. If you find a question for which you are convinced the key is wrong, please help us and your classmates out by asking about it on the discussion board.

CHAPTER 1. INTRODUCTION

TRUE/FALSE

21.12. With yes or no decisions, additional information is more valuable when the probability of success given an unfavorable signal is higher.

22.11. You examine 123 predictions made by a forecaster. They predicted good weather 77 times, and, were right 51 of those times. They correctly predicted bad weather 28 times. The probability of good weather given a prediction of bad weather is 18/46, or 0.3913.

22.12. Information which leads to larger adjustments to your initial probability assessments is less valuable.

23.11. A project costs $100 up front and returns $60 after one year and $70 after 2 years. If the interest rate is 0.2 (20%), the present value at the time of the initial investment is $0.00

Questions 23.16-23.18
Stephanie hired a consultant to report on the chance of success for 16 similar projects. 8 times the consultant gave good news and the project was successful. 2 times the consultant gave good news but the project failed. 2 times the consultant delivered bad news, but the project was successful. The rest of the time, the consultant gave bad news and the project failed. She is considering hiring the consultant to issue a report on a similar project, for which profit will be $400 if successful and -$800 if not. Relying on past experience to estimate future probabilities, answer the following questions.

23.16. The probability of failure with BAD news is 3/8.

23.17. With GOOD news, expected profit is 160.

23.18. The value of the information is 150.

MULTIPLE CHOICE

1.1. Small Inc. is considering undertaking a project that will cost $200 today. There is a .4 probability that the project will fail in one year, losing $275 at that time. Otherwise, the project will return $847 in 2 years. If the discount rate is 10%, what is the expected present value of this project?
A) 198   B) 250   C) 162   D) 120   E) none of the above

4.15.   Billy Bob's Gadgets is a firm that will exist for 2 years only. At the end of the first year, profits will be $120 with probability .6 and -$15 otherwise. At the end of the second year, profits will be $175 with probability .8 and -$95 otherwise. The discount rate is 10%. What is the value of Billy Bob's firm?
A) 166   B) 187   C) 200   D) 160

8.1. Jeremy must decide whether or not to acquire exclusive rights to produce rights to produce thingamajigs for 2 years. The purchase would cost him $100. The interest rate is 10%. Profits from thingamajig production will be received one year from purchase and then again two years from purchase. There is an 80% chance that thingamajig operating profits will be $77 next year, otherwise, they will be -$88. The second year, there is a 60% chance operating profits will be $242, otherwise they will be -$121. What is the expected present value of purchasing the rights to thingamajig production?

A) -$16   B) $0   C) $20   D) $36

3.33.   Marleah Corporation is considering opening a Krispy Kreme shop on Newberry Road. If they are successful, they will make $1,000. If they are not successful, they will lose $2,000, With no additional information, they think the chance of success is 60%. If they invest in gathering additional information, the probability they will turn up good news about the chance for success is 60%. If they turn up good news, the probability of success is 80%. If they turn up bad news, the probability of success is 20% What is the most they should pay to gather the additional information?

A) 440   B)   400   C)   240   D)   0   E)   -200

Questions 38-39. Mari is considering opening a coffee shop. If successful, profit will be $500, otherwise the venture will lose $300. Mari thinks the probability of success is 0.5. She can hire Chris to conduce a study to narrow the uncertainty. Chris informs her that there is a 0.5 probability the study will report the chance of success is 0.6. Otherwise, the study will report the probability of success is 0.4.

7.38.   What is the expected profit if Mari hires Chris and the report is favorable?
a) 20   b) 100   c) 180   d) 200

7.39.   What is the value of the study?
a) 0   b) 80   c) 100   d) 180

16.16. Joanne is considering expanding into a new market. If successful, she would make $50, otherwise she would lose $40. As it stands, she thinks her probability of success is 0.3. She can hire Morgan to conduct a more detailed study of the chances of success. She thinks there is a 0.3 chance Morgan will report the chance of success is 0.4, otherwise, Morgan will report the chance of success is 0.0. The value of Morgan's study is:

A) -4.
B) impossible to calculate with the information given.
C) 9.
D) 0.

19.3. Suppose a project requires an up front investment of $500. With probability 0.6, it will fail in one year, incurring a loss of an additional $200. Otherwise, the project will be worth $1,700 at the end of 3 years. If the interest rate is 0.04, what is the expected (net) present value rounded to 0 decimals?

A) -11   B) 60   C) -20   D) 17

22.9. Gustaf is considering expanding into a new market. If successful, he would make $100, otherwise he would lose $200. As it stands, he thinks the probability of success is 0.6. He can hire Morgan to conduct a more detailed study of the chance of success. He thinks there is a 0.6 chance that based on Morgan's will report he will reevaluate the chance of success as 0.9. Otherwise, he thinks Morgan will report will lead him to think the chance of success is 0.0. The value of Morgan's study is _____.
A) 42   B) 62   C) 90   D)   0

Questions 19-20 Information Value
Ryan is considering opening a new restaurant. He thinks there is a 0.65 chance he will be successful and make a profit of 1000. Otherwise, he will lose 200. He is considering hiring James to provide a report with additional information on the prospects for success. When Ryan purchased reports in similar circumstances in the past, they produced favorable signals of the chance of success 13 times. He proceeded each of those 13 times and was ultimately successful in 10 of those attempts. He also received 7 reports that produced unfavorable signals of the chance of success. While he did not proceed with the unfavorable signals, he thinks he would have been successful 3 of those 7 times, had he done so.

25.19. What is the probability of success if he hires James and receives a favorable signal?
A) 13/20   B) 10/17   C) 3/7   D) 10/13.

25.20. What is the value of the report in this case?
A) -110   B) 0   C) 110   D) 470

14.28. Your firm must produce output before knowing final demand with certainty. You know only that it might be either a high demand period or a low demand period. You have paid for a forecast of demand for the past 60 periods. Of those, 32 times the forecast correctly predicted high demand, 4 times it predicted high demand but demand turned out to be low, 4 times it predicted low demand but demand turned out to be high, and, 20 times it predicted low demand correctly. Extrapolating from past experience, if you buy one more forecast, what is the probability of high demand if the forecast predicts high demand?
A) 0.600   B)   0.775   C)   0.889   D)   1.000

Chapters 2 & 3: DEMAND, COST, AND PROFIT MAXIMIZATION, Applications And Extensions Of Optimal Production And Pricing

TRUE FALSE

6.2. With peak load pricing, when peak quantity demanded is higher than off peak quantity demanded for all prices under consideration, the marginal revenue off peak is equal to marginal production cost plus only a fraction of the capacity cost per unit, and the exact fraction is determined by the relative sizes of peak and off peak quantities.

21.2. Profit maximizing simple (third degree) price discrimination results in higher prices charged to groups with less elastic demand.

21.8. When peak demand is much higher than off peak demand, in general, the profit maximizing off peak quantity sets off peak marginal revenue equal to marginal operating cost plus a share of marginal capacity cost equal to the share of off peak sales in total sales.

22.8. With peak load pricing, the profit maximizing quantity to sell when demand is low may not depend on the cost of adding additional capacity.

3.1.   With uncertain demand, if storage is not possible and it turns out to be a bad year, you should always sell everything you produced to get what you can out of it, rather than throwing some of it away.

22.10. Assume all output must be produced before the demand uncertainty is resolved, output may not be stored, and there is free disposal. Then, then maximizing profit, marginal revenue is always maximized if demand turns out low.

4.3. Tamra sells thingamajigs. Suppose her marginal cost is constant and the elasticity of demand for her thingamajigs is also constant. In that case, the profit maximizing price of thingamajigs will be higher if the demand curve is shifted out and up by growth in the number of consumers in the market.

Questions 23.14 and 23.15 (Topic 2)
Suppose a firm has charged prices at many levels between $4 and $8. Based on a constant elasticity approximation, the estimated elasticity of demand is -3. Marginal cost is approximately constant at $2.

23.14. Based on the elasticity estimate, price should increase above $8.

23.15. Based on the elasticity estimate, price should decrease below $4.

MULTIPLE CHOICE

1.3. Suppose the elasticity of demand for thingamabob's sold by Susan is -6, and Susan's
      constant marginal cost is $10. To maximize profit, what price should Susan charge?
A) 60   B) 16   C) 12   D) 30   E) none of the above

12.8. Suppose you set the derivative of a profit function equal to zero, solve, and, get a negative
price as the solution. Assuming you did not make any mistakes in calculations, which of the
following is most likely.
A) You found a valley in the profit function, not a peak.
B) You should shut down, since 0 is better than a negative profit.
C) A non convergent algorithm would result in a better solution.
D) That is not possible.

12.3. Which of the following is true of marginal revenue?
A) It is negative if the elasticity of demand is -0.5.
B) It is equal to price.
C) It is negative if the elasticity of demand is -2.
D) It is greater than zero as long as price is proportional to marginal cost.

19.1. As demand becomes more elastic the profit maximizing price will _____.

A) increase   B) decrease   C) decrease then increase   D) increase then decrease

Questions 19 & 20

Rainy Day Productions has found that the fraction of the population in a market that buys tickets
to their Monster Truck Shows can be accurately approximated by (1-.01p), where p is price, as
long as price is below $100 per ticket. They are considering putting on a show in a market with a
population of 100,000, in a stadium seating up to 10,000, with a constant variable cost per ticket
purchaser of $20.

4.19.   What is the profit function for this show, if it is not sold out?
A) $10000(1-.01p)(p-20)$ B) $100000(1-.01p)(p-20)$
C) $100000(1-.02p)(p-20)$ D) $10000(1-.01p)p-200000$

4.20.   What quantity of tickets is sold to maximizes profit in this case?
A) 10,000   B) 20,000   C) 40,000   D) 100,000

Questions 6 – 8
Rainy Day Productions has found that the fraction of the population in a market that buys tickets to their Monster Truck Shows can be accurately approximated by $\dfrac{50}{p^2}$, where p is price, as long as price is above $15 per ticket. They are considering putting on a show in a market with a population of 1,000,000, in a stadium that seats 20,000, with a variable cost per ticket purchaser of $20.

1.6.   What is the profit function for this show, if it is not sold out?

A) $\dfrac{50,000,000(p-20)}{p^2}$

B) $\dfrac{50,000,000(p-15)}{p^2}$

C) $\dfrac{20,000(p-15)}{p^2}$

D) $\dfrac{20,000(p-20)}{p^2}$

E) none of the above

1.7. What is the profit function for the show if it is sold out?
A) $50,000,000(p-20)$
B) $50,000,000(p-15)$
C) $20,000(p-15)$
D) $20,000(p-20)$
E) none of the above

1.8. What price maximizes profit?
A) 35   B) 30   C) 50   D) 40   E) none of the above

Questions 6 and 7
Charles produces shows in medium sized towns. The fraction of the population that purchases tickets in similar towns is approximated reasonably well by $25p^{-5}$ as long as price (p) is at least $2. His constant per ticket cost is $4.

8.6. Letting N represent population and ignoring capacity constraints, Charles' profit function is:
A) $N25p^{-4}-N100p^{-5}$.
B) $N25p^{-5}-N4^{-5}$.
C) $N25p^{-4}-N100p^{-4}$.
D) $N25p^{-5}-4N$.

8.7 If population is 125,000 and the venue holds up to 625 customers, what price maximizes profit?
A) 4   B) 5   C) $5000^{(1/5)}$ or 5.49   D) $25000^{(1/5)}$ or 7.58

Questions 16 and 17 refer to the following information.
Suppose Luke is selling tickets in a market with 200,000 potential customers. From past experience in other towns, he believes the fraction that will purchase can be well approximated by $f(p) = 0.5p^{-2}$ as long as $p \geq 1$. Operating cost is constant at $5 per ticket. Capacity is 250 seats.

12.16. Which of the following is Luke's profit function?
A) $100000p^{-1} - 500000p^{-1}$ B) $200000p^{-1}(p - 2.5)$
C) $100000p^{-2} - 500000p^{-1}$ D) $100000p^{-2}(p - 5)$

12.17. What price maximizes profit?
A) 5   B) 10   C) 15   D) 20

15.6. Caroline is organizing a one night show in medium city, population 84,375. Marginal cost is $10 per admission. Caroline thinks purchases per capita are well approximated by $f = 2p^{-3}$, provided price (p) is above $10. Assuming plenty of capacity, profit is given by:
A) $84375p^{-3}(p - 10)$ B) $168750p^{-4} - 1687500p$
C) $42187.5p^{-4} - 421875p$ D) $168750p^{-3}(p - 10)$

15.7. If the best venue in medium city can seat 60, what ticket price should Caroline charge?
A)   14.11   B)   15.00   C)   18.90   D)   20.00

15.8. Caroline takes the show to big city, population 337,500, for one night. Assuming the best available venue seats 100 and that all factors other than population (demographics, per capita income, tastes, etc...) are the same in the two cities, what price should Caroline charge?
A)   14.11   B)   15.00   C)   18.90   D)   22.00

2.15. Kymica manages a chain of movie theatres in large cities. At night, the inverse demand for movies is given by $p = 18.5 - .05q_n$. During the daytime, the inverse demand is $p = 11.5 - .025q_d$ The constant marginal cost of a movie, with plenty of seating available, is $.50. The marginal cost of an additional seat of capacity for one movie is $6. What is the optimum seating capacity?
A) 100   B) 120   C) 153   D) 307   E) none of the above

3.60. Kymica manages a movie theatre. At night, the inverse demand for movies is given by $p = 20 - .025q_n$. During the daytime, the inverse demand is $p = 15 - .05q_d$ The constant marginal cost of a movie, with plenty of seating available, is $1. The marginal cost of an additional seat of capacity for one movie is $5. What is the optimum seating capacity?
A) 100   B) 140   C) 187   D) 280   E) 420

6.51.　　Myra owns and manages a gymnasium, and she notices that during the evenings there is much higher attendance as compared to any other part of the day. During the evenings demand is given by $p = 20 - .5q$. During the early parts of the day, demand is given by $p = 20 - q$. The marginal cost of a patron using the gym is \$4, and the cost of an additional unit of capacity is \$2. If Myra charges optimal prices for the high demand part of the day, and the low demand part of the day, what is the gym's capacity?

A)　0 to 9.99　　　　　B)　10 to 19.99　　　　C)　20 to 29.99　　　　　　　D)　30 or above

7.4.　　Consider a firm facing high demand at one time of day and low demand the rest of the time. Both operating and capacity costs per unit are constant. To maximize profits through peak load pricing, which of the following is true if off peak demand becomes sufficiently large relative to peak demand?

a)　The sum of high demand MR and low demand MR is set equal to twice the operating marginal cost plus twice the marginal capacity cost.

b)　The sum of high demand MR and low demand MR is set equal to twice the operating marginal cost plus the marginal capacity cost.

c)　High demand MR and low demand MR are each set equal to the marginal operating cost plus half the marginal capacity cost.

d)　High demand MR and low demand MR are set equal to the marginal operating cost plus a share of the marginal capacity cost depending on the MRTS.

Questions 18-20 refer to the following information.
Suppose the movie chain Dugan manages faces typical inverse demand given by
$p_A = 20 - 0.02q_A$ in the afternoon and $p_E = 20 - 0.01q_E$ in the evening. The operating cost of serving a moviegoer is \$3 and the capacity cost of adding a seat is \$1

12.18.　Which of the following is Dugan's profit function?

A) $(20 - 0.04q_A)q_A + (20 - 0.02q_E)q_E - 3q_A - 3q_E - q_E$

B) $(20 - 0.02q_A)q_A + (20 - 0.01q_E)q_E - 3q_A - 3q_E - q_E$

C) $(20 - 0.04q_A)q_A + (20 - 0.02q_E)q_E - 3 - 3 - 1$

D) $(20 - 0.02q_A) + (20 - 0.01q_E) - 3 - 3 - 1$

12.19.　What quantity should be sold in the evening to maximize profit?

A) 400　　　　B) 425　　　　C) 550　　　　D) 800

12.20.　What price should be charged for an afternoon ticket to maximize profit?

A) 9　　　　　B) 10.50　　　C) 11.50　　　D) 12

2.16. David manages an amusement park. In the summer, the inverse demand for admission from students is given by $p_s = 60 - .025q_s$ while the inverse demand from other customers is given by $p_o = 100 - .1q_o$. David's constant marginal cost is \$5. If David engages in 3rd degree price discrimination, what is her profit function?

A) $(160 - .1q_o - .025q_s)(q_o + q_s) - 5(q_o + q_s)$
B) $(100 - .1q_o)q_o + (60 - .025q_s)q_s - 5(q_o + q_s)$
C) $(160 - .125q)q - 10q$
D) $(100 - .1q)q + (60 - .025q)q - 5q$
E) none of the above

Questions 35-37
Sam is opening a new restaurant, and, must decide on his capacity. Capacity costs \$2 per unit and operating cost is \$3 per unit. He does not know what inverse demand will be, only that it will be high, $p_H = 12 - 0.5q_H$, with probability 0.6 and otherwise it will be low, $p_L = 12 - q_L$. He will learn the state of demand before producing and incurring operating costs, but must choose capacity before the uncertainty is resolved.

18.35. Assuming sales will be higher with high demand than with low demand, which of the following is Sam's profit function?
A) $\pi = 0.6(12 - 0.5q) + 0.4(12 - q)q - 5q$
B) $\pi = 0.6((12 - 0.5q_H)q_H - 3q_H) + 0.4((12 - q_L)q_L - 3q_L) - 2q_H$
C) $\pi = 0.6((12 - 0.5q_H)q_H - 5q_H) + 0.4((12 - q_L)q_L - 3q_L)$
D) $\pi = 0.6(12 - 0.5q_H)q_H + 0.4(12 - q_L)q_L - 5q_H$

18.36. If you solve a problem like this and the solution calls for lower sales at high demand than at low demand, how do you determine capacity?
A) Take the lower of the two values.
B) Take the higher of the two values.
C) Take the midpoint of the two values.
D) Solve a problem built on a different assumption.

18.37. What capacity will maximize expected profits?
A) 6.5   B)   5.67   C)   4.5   D)   5

3.32.   Suppose that you manage at a factory that produces shoes. In any given period, demand might be high or low, but, you don't know which when you produce the shoes to be shipped that period. All you know is that the probability of a good year is .75. If you produce more than is sold, you can store it until next period at a cost of \$3 per unit. Inverse demand in a good year is $p_g = 160 - .8q_g$ and in a bad year it is $p_b = 120 - .8q_b$. The constant marginal cost is \$7. What quantity is produced to maximize expected profit? (Round to whole units)
A) 70   B)   85   C)   95   D)   140   E)   190

22.6. Lewis is organizing a one night show in medium city, population 84,375. Marginal cost is $10 per admission. He thinks purchases per capita are well approximated by $f = 2p^{-3}$, provided price (p) is above $10. Assuming plenty of capacity, profit is given by:

A) $84375p^{-3}(p-10)$ B) $168750p^{-4} - 1687500p$

C) $42187.5p^{-4} - 421875p$ D) $168750p^{-3}(p-10)$

22.7. (Continued from the previous question) Lewis takes the show to big city, population 337,500, for one night. Assuming the best available venue seats 100 and all factors other than population (demographics, per capita income, tastes, etc…) are the same, what price should he charge?

A) 14.11   B) 15.00   C) 18.90   D) 22.00

Questions 34 and 35
Your firm must produce output before knowing final demand with certainty. You know only that it might be either a high demand period or a low demand period. You have paid for a forecast of demand for the past 40 periods. Of those, 26 times the forecast correctly predicted high demand, 2 times it predicted high demand when demand turned out to be low, 3 times it predicted low demand but demand turned out to be high, and, 9 times it predicted low demand correctly.

3.34.   Extrapolating from past experience, if you buy one more forecast, what is the probability of high demand if the forecast predicts high demand? (Round to 3 decimals)

A) .650   B) .700   C) .897   D) .929   E) 1.000

3.35.   Extrapolating from past experience, what is the probability that the forecast will return good news, that is, a prediction of high demand? (Round to 3 decimals)

A) .650   B) .700   C)   .725   D)   .897   E) 1.000

Questions 36 and 37
Suppose that you manage at a firm that produces thingamabobs. In any given period, demand might be high or low, but, you don't know which when the level of production is chosen. If you produce more than is sold, it is not economical to store output until next period. Inverse demand in a good year is $p_g = 16 - .5q_g$ and in a bad year it is $p_b = 12 - .5q_b$. The constant marginal cost is $2. You can purchase a forecast of demand. If you do not purchase a forecast, expected profit is $70. If you buy a forecast and it is good news, expected profit is $85. From past experience, you know that the probability of good news (a forecast of high demand period) is .5 and that the probability of good period (high demand) if the forecast is bad news (predicts low demand) is .25. That is: Pr(GN)=.5, and Pr(GP|BN)=.25.

3.36.   What quantity should you produce to maximize profit if you buy another forecast and it predicts a bad year (bad news)? (Round to whole units)
A) 6   B) 11   C) 12   D) 20   E) 26

3.37.   What is the expected value of another forecast? (Round to 2 decimals)
A) 1.50   B) 2.75   C) 3.28   D) 48.00   E) 60.50

Questions 55 and 56

Suppose that you manage a firm that produces thingamabobs. In any given period, demand might be high, $p_H = 16 - .5q_H$ or low, $p_L = 12 - .5q_L$, but, you don't know which, when the level of production is chosen. If you produce more than is sold, it is not economical to store output until next period. The constant marginal cost is \$2. You can purchase a forecast of demand. If you do not purchase a forecast, expected profit is \$70. If you buy a forecast and it is good news, expected profit is \$85. From past experience, you know that the probability of good news (a forecast of high demand period) is .5 and that the probability of high demand if the forecast is bad news (predicts low demand) is .25. That is: Pr(GN)=.5, and Pr(H|BN)=.25.

6.55. What quantity should you produce to maximize profit if you buy another forecast and it predicts a bad year (bad news)?
A) 0 to 4.99   B) 5 to 9.99   C) 10 to 19.99   D) 20 or more

6.56. What is the expected value of another forecast?
A) \$0 to \$1.99   B) \$2 to \$2.99   C) \$3 to \$3.99   D) \$4 or more

Questions 9 and 10

It is Friday night and Andrew must schedule a delivery of coleslaw to be served as a side dish at his hamburger stand at the beach Saturday. Coleslaw costs Andrew \$0.5 per serving. If it is sunny, inverse demand for coleslaw will be $p = 3 - .0001q_H^2$ If it is rainy, inverse demand will be given by $p = 3 - .0002q_L^2$. Left over coleslaw must be thrown out.

9.9. If Andrew thinks the probability of rain is 0.5, how many servings of coleslaw should he order to maximize his expected profits?

A) 81.65   B) 74.53   C) 70.71   D) 57.73

9.10. Andrew could get up at 4:00 am, get an updated forecast, and call in the coleslaw order by 5:00 a.m. He is planning to stay out late drinking with his fraternity brothers tonight though, so the cost of getting that additional information is high. He is trying to decide if the benefit outweighs the cost. In the past when conditions were similar he caught the 4:00 am forecast 40 times. Of those, 16 times sunshine was correctly predicted, 14 times rain was correctly predicted, 4 times sunshine was predicted but it rained, and, 6 times rain was predicted but it was sunny. Based on that sample, the probability of high demand given a favorable report is _____, and the probability of high demand given an unfavorable report is _____.

A) 0.5, 0.5   B) 0.8 0.2   C) 0.8, 0.3   D) 0.75, 0.25

Questions 17-18 Peak Load Pricing
Katie operates a chain of movie theaters. The fraction of potential customers that might purchase a ticket in the evening is approximated by $f_E = p_E^{-2}$, and the fraction that might purchase in the afternoon is approximated by $f_A = p_A^{-3}$. She is opening a new location where there are 6400 potential evening customers and 2200 potential afternoon customers. The cost of serving a customer given enough capacity is $3. The cost of adding the capacity to serve another customer is $1.

25.17. What is the optimal seating capacity?
A) 60   B) 80   C) 90   D) 100

25.18. What is the optimal price in the afternoon?
A) 4.5   B) 6   C) 6.5   D) 8

Chapters 4-6. Estimating and Interpreting Approximations, Evaluating Regression Analyses, and Omitted Variables Bias

TRUE FALSE

3.16. A very important criterion for evaluating a regression for to be used for purely predictive purposes is the size of the root mean square error relative to the size of the prediction you are interested in.

6.14. Measurement error with respect to explanatory variables creates no fundamental problems for regression analysis. Rather, it simply adds more random variation, so that more data must be collected to get precise predictions.

25.23. The lack of random assignment in observational as opposed to experimental data means a researcher can never know with a very high degree of certainty if they have identified a causal effect with standard regression analysis.
A) True   B) False

25.24. A regression discontinuity approach is warranted only if the dependent variables are inherently categorical and not continuous.
A) True   B) False

25.25. Panel data can allow one to come closer to identifying causal effects by differencing out unmeasured idiosyncratic effects that are approximately constant over time.
A) True   B) False

3.13. Omitted variables bias occurs when an explanatory variable included in your regression model should have been omitted from the first stage, but was not.

3.14. Bias is more of a concern for prediction than for parameter estimation.

3.15. When unsure whether or not to include a variable in a regression, it should always be included, since including more variables always increases precision and reduces the possibility of bias.

Questions 23.12 and 23.13 (Topic 2)
At a price of $4, 10 units are sold, while at a price of $8, 5 units are sold.

23.12. The slope of linear *inverse* demand curve through those points is -0.6.

23.13. For a constant elasticity approximation through these points, $\eta = \dfrac{\ln(2)}{\ln(4/5)} \approx -3.1$.

6.13. If your primary purpose for using the results of a regression analysis is to predict the value of the dependent variable, for example, weekly sales, then checking for omitted variables bias and simultaneous equations bias are more important than the relative magnitude of the root mean square error.

6.15. Data that follows a group of individuals over time (panel data) generally eliminates omitted variables bias because it allows the researcher to hold constant everything unique about each individual pertaining to the variables of interest.

22.48. Including city dummy variables as explanatory variables would control for omitted variables bias arising from omitted city level characteristics that do not systematically vary over time.

22.50. Instrumental variables are the explanatory variables that have the lowest standard errors.

23.3. A compensating differential is an adjustment to correct for omitted variables bias.

23.4. If a regression model is not accurate enough for its intended purpose, trying out any variables that are available as explanatory variables and keeping the ones that result in the largest reductions in the root mean square error is a good idea.

MULTIPLE CHOICE

4.18. Big Inc lowers the price it charges for its industrial impact drivers from \$600 to \$500. As a result, weekly sales increase from 500 to 800. Assuming the demand function for Big Inc's impact drivers is log-linear, or, constant elasticity, what is the elasticity of demand for Big Inc's Compressors (η)?

A) $\big(\ln(500) - \ln(800)\big) - \big(\ln(600) - \ln(500)\big)$

B) $\ln(500/800)/\ln(600/500)$

C) $\ln(800/500)/\ln(600/500)$

D) $\big(\ln(800) - \ln(500)\big) - \big(\ln(600) - \ln(500)\big)$

Questions 4 & 5
Big Inc lowers the price it charges for its industrial impact drivers from \$600 to \$500. As a result, weekly sales increase from 500 to 800. Assuming the demand function for Big Inc's impact drivers is linear (that is, of the form $q = a - bp$) answer the two questions below.

1.4.   What is the slope of the demand curve for Big Inc's Compressors (-b)?
A) -100   B) -300   C) -3   D) -0.3   E) none of the above

1.5.   What is the intercept of the demand curve (a)?
A) 2,100   B) 2,300   C) 500   D) 800   E) none of the above

Questions 19.4 and 5
Suppose 20 units are sold at a price of $100, 5 units are sold at a price of $150, and variable cost per unit is constant and equal to $40.

19.4. Using a log linear approximation, what is the elasticity of demand?

A) $\ln(3/2)/\ln(1/4) = -0.3$

B) $\ln(3/2) - \ln(1/4) = 1.8$

C) $\ln(1/4)/\ln(3/2) = -3.4$

D) $\ln(1/4) - \ln(3/2) = -1.8$

19.5. Using a log linear approximation, what price maximizes profit (rounded to 0 decimals)?

A) 57   B) 90   C) 26   D) -17

7.26.   Tina hired Will, an econometric consultant, to go over the results. He is concerned that the price and advertising coefficients may be biased. Which of the following is something he may be worried about?

a) The endowment affect and framing issues causing over consumption at new locations, but the age of the location is not controlled for.
b) Price is likely to be higher in cities where labor costs are higher, but labor cost is not controlled for.
c) Advertising is likely to be lower in cities where the cost of advertising is higher, but the cost of advertising is not controlled for.
d) Price is likely to be higher in cities where demand is higher due to hot temperatures, but, temperature is not controlled for.

22.49. Which of the following statements about using regression results to predict demand when values of independent variables like price or income are outside the range of the sample is true?
A) It is reasonable if the values of the independent variables are less than one standard deviation outside the sample.
B) It is reasonable when the predictions are within one standard deviation of the sample mean.
C) It is not possible to know much about the accuracy of such predictions from estimates and statistics produced from the sample.
D) The RMSE is the proper way to evaluate the likely accuracy of such predictions.

Questions 31-35

Suppose Hernandez Ltd. randomly varies its price over a period of time as well as across cities in order to collect information on its demand curve. An OLS regression of weekly quantity (units) on price (dollars), population (thousands of people), per capita income (thousands of dollars), and annual advertising expenditures (thousands of dollars) generates the output shown in the table below. All variables were entered in linear form.

Variable	Coefficient	Standard Error
Price (Dollars)	-400	150
Population (1000s)	10	4
Per Capita Income (1000s)	20	5
Advertising (1000s)	50	20
Constant	1500	75
Observations		499
F(4,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		200

6.31. In a market with population, per capita income, and advertising expenditures (all in thousands) of 100, 25, and 20, respectively, an approximate 95% confidence interval for quantity demanded at a price of $5 is

A) -400 to 400
B) -200 to 200
C) 1600 to 2400
D) 1800 to 2200

6.32. An approximate 95% confidence interval for the slope of the demand curve is
A) -300 to 300
B) -700 to -100
C) -550 to -250
D) -150 to 150

6.33. If the results may be taken at face value, which of the following is the best summary of their usefulness in a market with population, per capita income, and advertising expenditures (all in thousands) of 100, 25, and 20, respectively, and a price in the neighborhood of $5?

A) The results will yield reliable predictions of sales and accurate estimates of the effect of price changes on quantity demanded, since the F statistic and the coefficient on price are both statistically significant.

B) Predictions of sales may be reasonably accurate since the RMSE is only about 10% of predicted sales at a price of $5. But, extreme caution is in order using the coefficient on price to estimate the slope of the demand curve, since its standard error is over one-third of the magnitude of the coefficient.

C) Great caution is in order regarding predictions of sales, since the RMSE is about 100% of predicted sales at a price of $5. But, the coefficient on price to estimate the slope of the demand curve, since it is statistically significant.

D) Great caution is in order regarding predictions of sales since the RMSE is about 100% of predicted sales at a price of $5 and regarding using the coefficient on price to estimate the slope of the demand curve, since its standard error is over one-third of the magnitude of the coefficient.

6.34. Suppose that Hernandez Ltd. varied price from $2 to $6 during their experimental period and now wants to make a prediction about demand at a price of $12. Which of the following is most reasonable?

A) Since the price was varied randomly, predictions up to double the magnitude of the highest price should be reasonably accurate.

B) All bets are off, because no data was observed in that range.

C) The parameter estimate may be misleading because no data was observed in that range, but, the predicted values should be reasonable since bias is not an issue for prediction.

D) If $12 is within 2.5 standard deviations of the average observed price, there should be no problems with the regression results.

6.35. Suppose that, rather than randomly varying price, price had been determined to maximize profits in each city. In that case:

A) The interpretation of the results is basically the same, since the F-statistic and all coefficients are statistically significant by conventional standards.

B) The interpretation is basically the same, but we must allow for the fact that the confidence intervals may be wider.

C) The fact that price is endogenously determined automatically leads to a correlation between and introduces bias into the estimates of the parameters, but, use of the model for predicting total sales may still be valid.

D) The fact that price is endogenously determined automatically leads to a correlation between, and introduces bias into, the estimates of the parameters, and use of the model for predicting total sales is also no longer valid.

17.9. Which of the following statements regarding econometrics is true?

A) Bias is more of a concern for predicting the dependent variable than for parameter estimation.

B) When unsure whether to include a variable in a regression, it should be included, since including variables always increases precision and reduces bias.

C) A very important criterion for evaluating a regression to be used purely to predict a dependent variable is the size of the root mean square error relative to the predicted value.

D) A coefficient is accurately estimated if its standard error is small the p-value is less than 0.01.

17.10. A problem with natural experiments is

A) natural experiments are double blind.

B) policy changes that are used as natural experiments may actually have been instituted in anticipation of or in conjunction with other related developments in the areas under study.

C) Mother Nature does not like it when people experiment on her.

D) researchers can not properly model relationships between natural events and economic phenomenon without more detailed estimates of the productivity effects of weather patterns.

Questions 23-26. Tina's *I Scream* company has conducted research on the daily sales for 20 ice cream shops all located along beaches in coastal cities over the course of three summers. She regressed the quantity of ice cream cones sold on the price charged (in dollars), the square root of advertising expenditures for each shop (also in dollars), the per capita income in each city (in thousands of dollars), the local population (in thousands of residents), the distance from the shore (in hundreds of feet) and on a dummy variable included for whether or not it was raining on that day (0=no, 1=yes).

Variable	Coefficient	Standard Error
Price	-500	55
Square Root of Advertising	8	12
Per Capita Income	40	10
Population	20	4
Distance from Shore	-5	35
Rainy Day	-150	60
Intercept	1500	20
Observations		5400
F		90
Probability > F		.000
Root Mean Square Error (RMSE)		70

7.23. *I Scream* is considering opening a new location in Arid City, which has a population of 10,000 residents and a per capita income of $45,000. The shop would be 600 feet from the shore and she would set a price of $2 per cone and an advertising budget of $225 per day. For a day without rain, an approximate 95% confidence interval for the quantity of cones sold would be:

a) (1480,1520)
b) (1360,1640)
c) (2450, 2730)
d) (2300,3000)

7.24. The appropriate interpretation of the price coefficient is that it:
a) Passes the test of significance and suggests that a $1 increase in price will decrease quantity by 500.
b) Passes the test of significance and suggests that a $55 increase in price will decrease quantity by 500.
c) Passes the test of significance and suggests that a $1 increase in price will increase quantity by 55.
d) Fails the test of significance and should not be used as a predictor because its coefficient suggests a nonsensical price of -$500.

7.25. Hudson is hired to manage a division of *I Scream*. He took a statistics class early in college, and has some basic understanding of regression output, but he does not understand the problem with extrapolating outside of the observed range of data. Which of these mistakes would he be ***most likely*** to make as a result of erroneously ***extrapolating***?

a) Using the regression for a city with a population over 10000, despite there only being 5400 observations.
b) Deciding to open an *I Scream* location in a city where the median age is above the national average, since age was not controlled for in the model.
c) Since the observed data saw advertising figures between 2000 and 3000 per day, Hudson estimates that they may be around $2500.
d) Using the regression to model demand for a new inland location, since all the data is from coastal locations.

7.26. Tina hired Will, an econometric consultant, to go over the results. He is concerned that the price and advertising coefficients may be biased. Which of the following is something he may be worried about?

a) The endowment affect and framing issues causing over consumption at new locations, but the age of the location is not controlled for.
b) Price is likely to be higher in cities where labor costs are higher, but labor cost is not controlled for.
c) Advertising is likely to be lower in cities where the cost of advertising is higher, but the cost of advertising is not controlled for.
d) Price is likely to be higher in cities where demand is higher due to hot temperatures, but, temperature is not controlled for.

17.11. Which of the following statements about using regression results to predict demand when values of independent variables like price or income are outside the range of the sample is true?
A) It is reasonable if the values of the independent variables are less than one standard deviation outside the sample.
B) It is reasonable when the predictions are within one standard deviation of the sample mean.
C) It is not possible to know much about the accuracy of such predictions from estimates and statistics produced from the sample.
D) The RMSE is the proper way to evaluate the likely accuracy of such predictions.

14.27. A problem with relying on natural experiments to reduce OVB is that

A) natural experiments are double blind.
B) policy changes that are used as natural experiments may have been instituted in anticipation of or in conjunction with other related developments in the areas under study.
C) Mother Nature does not like it when people experiment on her.
D) researchers can not properly model relationships between natural events and economic phenomenon without more detailed estimates of the productivity effects of weather.

Questions 4-8 share common information.

11.4. Diana sells gadgets. While every demographic group purchases her gadgets, sales are disproportionately strong to retired Caucasian women, and, are disproportionately strong in summer months. She wants to estimate a log linear demand approximation. That is $q = Ap^{\eta}$ or $\ln(q) = \ln(A) + \eta \ln(p)$ where η stands for the price elasticity of demand and A represents the aggregate affect of other systematic factors. At her normal price of $5 Diana sells 100 units per week. She runs a sale price of $4 for several weeks and sells 200 units weekly. Based only on these 2 data points, the estimated price elasticity of demand is:

A) $\ln(4/5) - \ln(200/100)$

B) $\dfrac{\ln(200/100)}{\ln(4/5)}$

C) $\ln(200/100) - \ln(5/4)$

D) $\dfrac{\ln(100/200)}{\ln(4/5)}$

Variable	Coef.	Std. Err.	t	p-value
ln(price)	-4.5	1.5	-3.0	0.003
ln(Advertising)	-0.02	0.05	-0.4	0.689
ln(Population)	0.8	0.25	3.2	0.001
ln(Income)	0.75	0.5	1.5	0.134
Constant	-4	0.5	-8	0.000
Observations				2500
F(5,2495)				31.5
Probability > F				<0.000
Root Mean Square Error (RMSE)				0.30

Instead of relying on the estimate from the last question, suppose Diana collected more data and fit the log linear approximation using regression analysis. Her data cover 100 weeks at locations in 25 different cities across the country, for 2,500 observations total. She collects data on units sold, price charged, city population, average income in the city, and weekly advertising expenditures for each data point. She regresses the natural log of units sold on natural logs of the other variables, that is:

$$\ln(q) = B_0 + \eta \ln(price) + B_{Ad} \ln(Advertising) + B_{Pop} \ln(Population) + B_{Inc} \ln(Income) + Error$$

Prices and advertising levels are set for each location by the local manager. The data cover prices from $3 to $5, advertising from $200 to $400, populations from 50,000 to 1,000,000, and per capita incomes from $30,000 to $ 45,000. Results are given in the table above.

11.5. Assuming marginal cost is equal to $2 and using the fact that the profit maximizing price is

equal to $\dfrac{\eta}{1+\eta} MC$, the approximate 95% confidence interval for the price elasticity of

demand suggests the optimal price probably lies between:

A) 3.00 and 6.00.
B) 1.15 and 2.31
C) 1.15 and 3.00.
D) 2.31 and 6.00.

11.6. Suppose she plans to open a new location at which she will charge a price of $7 (ln(7)=1.95) and spend $300 per week advertising (ln(300)=5.7). Also, at the new location the log of population is 11.5 and the log of per capita income is 10.5. The predicted log of quantity at the new location is _____.

A) 2.10   B)   5.16   C)   4.19   D)   3.68

11.7.   Which if the following statements about omitted variables bias (OVB) is correct in this case? (Refer to the common information on the previous page.)

A) OVB may be a problem for the advertising coefficient as it has an unexpected sign and is not statistically significant, but not for the price coefficient as it has the right sign and is statistically significant.

B) Since price and advertising are determined by the local managers to reflect local conditions, rather than by supply and demand, and since population and income are not determined by market forces either, she should not be concerned.

C) OVB may be a serious problem for interpreting any of the individual coefficients, but, is not a severe problem in and of itself if the only purpose of the regression is to predict total weekly sales.

D) OVB may be a problem for the price and advertising coefficients, but can not affect the income and population coefficients, since they are not determined by market forces.

11.8.   Which if the following statements about corrections for OVB is *NOT* correct in this case? (Refer to the common information on the previous page.)

A) Including a dummy variable for whether or not it is summer may reduce OVB.

B) Completely randomizing prices and advertising for a number of cities might help, by reducing the correlation with the omitted variables, but, might also reduce precision by introducing random noise in those important variables.

C) Using local restrictions on advertising, local prices for advertising space, and local taxes and labor costs as instrumental variables may help reduce OVB.

D) Collecting data on the detailed demographic characteristics of each city may reduce OVB.

Questions 15-20. The gadget market is perfectly competitive with supply and demand conditions unique to each city. The Federal government is considering imposing an ad valorem tax of 10% on gadget sales. The gadget trade association hired your firm to quantify the economic effects of the tax. You gathered 5000 monthly observations on quantity transacted, the price paid by consumers, population, and per capita income spanning 50 cities over 100 months (50X100=5000). Using that data, you used ordinary least squares regression to estimate demand, producing the results given in the table to the right.

Variable	Coefficient	Standard Error
Price (Dollars)	-100	200
Population (1000s)	20	15
Per Capita Income (1000s)	10	25
Constant	1000	75
Observations		5000
F(4,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		200

18.15. Taking the results at face value, what is the best interpretation of the population coefficient?

A) Its sign is reasonable but there is no statistically significant evidence of a relationship between quantity and population.

B) Its sign is reasonable and there is statistically significant evidence of a relationship between quantity and population.

C) It is statistically significant but the sign is not reasonable.

D) The sign is not reasonable nor is it statistically significant.

18.16. Suppose the price paid by consumers is 10, per capita income is $30 (thousand), and population is 150 (thousand). What is the approximate upper limit of a 95% confidence interval for quantity?
A) 2300
B) 3000
C) 3700
D) 4200

18.17. Taking the results at face value, estimate the equilibrium price if there is no tax in a city where per capita income is $30 (thousand), and population is 150 (thousand) and supply is $Q_S = -200 + 200p$.
A) 10
B) 15
C) 20
D) 25

Questions 18-20 are in other topics

19.6. Which of the following are true when using regression analysis to fit an approximation?

I) Adding more variables can only increase accuracy in predicting future outcomes.
II) Adding more variables can make the model unstable, making it useless for prediction.
III) It is good to have a large number of degrees of freedom and better to validate out of sample.
IV) Predicting out of sample is fine if the R-Square is high and the standard errors low.

A) I, III, IV   B) II, III, IV   C) I, IV   D) II, III

Questions 19.7 and 8
Daily umbrella sales per capita, q/N, depend on price (p), per capita income (m), and whether it rains on the day in question. You run a linear regression of q/N on p, m, and R, where R is an indicator (dummy) variable that is equal to 1 if there was significant rain on the day in question and 0 otherwise. The form of the regression you estimate is:
$q/N = \beta_0 + \beta_1 p + \beta_2 M + \beta_3 R + \beta_4 Rp$.

19.7) What is the elasticity of demand if p=10, q/N=0.1, and it is a rainy day (R=1)?
A) 100   B) $0.01\beta_1$ C) $100(\beta_1 + \beta_4)$ D) 0.01

19.8) If customers are less price sensitive on rainy days, β_4 is _____.
A) positive   B) negative   C) elastic   D) inelastic

Questions 22.46-48

A firm collects five years worth of monthly data on units sold (Q), price charged (P), advertising expenditures (A), and family income (M) across 50 cities (50 x 12 x 5 = 3,000 observations). Managers in each city choose their own local advertising level and price, within a fairly large range allowed by the firm's central management. A regression of the log of quantity on the log of each of the independent variables yields the results shown at right.

Variable	Coef.	Std. Err.	t	p-value
ln(p)	-4.5	1.5	-3.0	0.003
ln(A)	-0.02	0.05	-0.4	0.689
ln(Pop)	0.8	0.25	3.2	0.001
ln(M)	0.75	0.5	1.5	0.134
Constant	-4	0.5	-8	0.000
Observations			3000	
F(5,2995)			31.5	
Probability > F			<0.000	
(RMSE)			0.30	

22.46. The estimated demand curve is _____.

A) $Q_D = -4 - 4.5p - 0.02A + 0.8Pop + 0.75M$

B) $Q_D = -4 - 4.5\ln(p) - 0.02\ln(A) + 0.8\ln(Pop) + 0.75\ln(M)$

C) $\ln(Q_D) = -4 - 4.5p - 0.02A + 0.8Pop + 0.75M$

D) $Q_D = e^{-4}p^{-4.5}A^{-0.02}Pop^{0.8}M^{0.75}$

22.47. The lower limit of an approximate 95% confidence interval for demand elasticity is _____.

A) -5.1   B) -4.8   C) -6   D) -7.5

Questions 21 & 22

A regression of quantity sold per capita (quantity/population) on price, average income (in thousands) and advertising (in thousands) produced the results in the table to the right.

Variable	Coef.	Std. Err.
Price	-0.04	0.025
Advertising	0.01	0.008
Income	0.005	0.004
Constant	0.08	0.06
Obs	154	
RMSE	0.005	
R-Square	0.24	
F-Stat	22	
p(F-Stat)	0.0002	

25.21. What quantity (in thousands) is demanded if price is 10, advertising is 20 (thousand), income is 30 (thousand) and population is 50 (thousand)?

A) 0.5   B) 1.5   C) 2   D) 2.5

25.22. What is the approximate upper limit of a 95% confidence interval for quantity demanded (in thousands) in the previous question?

A) 0.5   B) 1.5   C) 2   D) 2.5

11.9.   A problem with relying on natural experiments to reduce OVB is that

A) natural experiments are double blind.

B) many policy changes that are used as natural experiments may actually have been instituted in anticipation of or in conjunction with other related developments in the areas under study.

C) Mother Nature does not like it when people experiment on her.

D) researchers can not properly model relationships between natural events and economic phenomenon without more detailed estimates of the productivity effects of weather patterns.

Chapter 7-9 - Individual Choice and Non Linear Pricing

TRUE/FALSE

3.3. The theory of individual choice is based purely on graphical analysis, since individual preferences can not be represented by mathematical functions.

3.4. The theory of individual choice assumes that as a consumer has more of one good, she is willing to give up less and less of any other good for still more of the first good.

21.7. A Diminishing Marginal Rate of Substitution implies a preference for variety.

23.5. Giffen goods at the level of an individual can only occur for inferior goods for which the customer spends a small fraction of their income. (Topic 7)

23.6. The four assumptions of consumer theory are not sufficient to guarantee demand slopes down. (Topic 7)

22.43. Diminishing marginal utility is one of the assumptions of consumer theory.

23.7. A diminishing marginal rate of substitution implies a preference for variety. (Topic 8)

21.1. If all consumers are identical, a monopoly charging a profit maximizing two part price maximizes value added and captures it all as profit.

23.1. Block pricing is more effective than two-part pricing with identical customers, because it forces customers into all or nothing decisions, thereby increasing sales.

23.2. Block pricing and two part pricing increase value added relative to simple linear pricing.

Questions 23.19 and 23.20

Suppose there are many identical customers with willingness to pay given by $V = 100q^{0.5}$. Marginal cost is constant at $10.

23.19. If a profit maximizing two-part price is charged, the per unit price component is $20.

23.20. If a profit maximizing two part price is charged, the fixed fee component is $250.

3.25. In a menu pricing problem with two types of consumers, the low demand customer would never want the option designed for the high demand customer, so, to maximize profits, the firm should charge the low demand customer the highest price they are willing to pay for the quantity in the package designed for them.

6.1. With menu pricing, as you make the bundle you're offering a low demand customer smaller and smaller relative to their ideal bundle, you may actually increase profit by making it less tempting for the high demand customer to choose the small bundle, even though you are reducing total surplus by selling less output than the small customer would willingly buy at a price equal to marginal cost.

6.3. When offering two products individually or in a bundle, the only way bundling two products is profitable is when the price that can be charged for the bundle is greater than that of the sum of the prices of each individual product.

MULTIPLE CHOICE

6.39.   A meal at Chili's usually costs Nancy $18, a meal at Moe's usually costs her $10, and a meal at Wendy's usually costs her $6. At her current consumption bundle, she thinks another meal at Chili's would be just as good as 3 more meals at Wendy's. Another meal at Moe's is just as good as 2 more meals at Wendy's. If Nancy's preferences satisfy the standard assumptions about consumer behavior, which of the three restaurants will she choose?
A) Chili's   B) Moe's   C) Wendy's   D) Nancy will be indifferent.

7.32.   Which of the following is true of economic models of consumer behavior with certainty?
a) It is based entirely on graphical analysis, since preference rankings can not be represented by mathematical functions.
b) It assumes that the marginal utility of a good diminishes as a consumer consumes more of it.
c) It assumes that a consumer is willing to give up more and more of an inferior good in exchange for another unit of a normal good the higher the ratio of the inferior good to the normal good in the consumer's bundle.
d) It assumes that a consumer is willing to give up less and less of any one good in exchange for another unit of any other good as the consumer has more of the second and less of the first along an indifference curve.

9.12.   Which of the following is true of the economic model of consumer behavior with certainty?
A) It is based entirely on graphical analysis, since preference rankings can not be represented by mathematical functions.
B) It assumes that the marginal utility of a good diminishes as a consumer consumes more of it.
C) It assumes that the MRS of an inferior good is always less than the MRS of a normal good.
D) It assumes more is preferred to less and that individuals prefer some variety in the consumption bundle.

11.10. In constrained optimization problems like cost minimization or utility maximization, the optimization condition is
A) the ratio of the marginal costs of any two choice variables must equal to the ratio of their marginal benefits.
B) marginal revenue equals marginal cost
C) The Lagrange multiplier must equal the market value of the least costly choice variable.
D) The Lagrange multiplier must be equal to 0.

17.5. At Mark's current optimal level of consumption, he would be just willing to give up 3 six packs of Natty for one more six pack of Samuel Adams. Therefore
A) Mark is indifferent between buying a six pack of Natty and a six pack of Samuel Adams at a $3 premium over a six pack of Natty.
B) Mark's marginal rate of substitution of Samuel Adams for Natty is always 3.
C) the price of Samuel Adams is three times the price of Natty.
D) at any consumption bundle, Samuel Adams provides more utility than Natty.

2.10. Suppose that an individual consumer's willingness to pay for a product is given by
$V(q) = 10q^{1/2}$. Which of the following is the consumer's inverse demand curve?
A) $p = 5q^{1/2}$
B) $p = 10 - .5q$
C) $p = 5q^{-1/2}$
D) $p = 5 - .5q$
E) none of the above.

16.17. Jake's total willingness to pay for Burrito Brother's burritos is given by $V = 6q^{0.5}$. Jake's inverse demand for burritos is
A) $p = 6 - q$.
B) impossible to calculate with the information given.
C) $p = 3q^{-0.5}$.
D) $p = 12q^{-0.5}$.

14.4. Suppose initially Joe spends $16 on pizza and beer, the price of pizza is $2 per slice, and, the price of beer is $1 per bottle. Joe chooses 4 slices of pizza and 8 bottles of beer. Which of the following is true of the amount of money necessary to fully compensate Joe (so he can reach the same utility) if the price of beer increases to $2?

A) $8 is exactly enough, since he could buy the same with the same MRS.
B) $8 is more than needed, since he could buy the same bundle but does not.
C) The compensating differential is proportional to the MRS at the initial bundle.
D) The compensating differential is inversely proportional to the initial price ratio.

Questions 1-4

Michael's utility function is $u = A + \ln H + \ln E$ where H is his consumption of housing (in square feet), E is consumption (in dollars) of everything else, and, A represents his evaluation of the non monetary benefits of the city he lives in. Currently, Michael earns \$80,000 annually working in Miami where $A=10$, the price of housing, R, is \$20 per square foot, he chooses a 2000 square foot residence, and he spends 40,000 on everything else (so $u=28.2$).

17.1. Which of the following is the marginal rate of substitution of H for E (MRS_{HE})?
A) E/H B) $H - E$ C) $\ln H / \ln E$ D) $\ln E - \ln H$

17.2. In a city where $R=10$, which of the following represents his optimal choice of H and E?
A) $H - E = 0.1$ B) $E/H = 10$ C) $\ln H / \ln E = 10$ D) $0.1\ln E = \ln H$

17.3. If his income is \$$M$ and $R=10$, which of the following gives his optimal choice of H?
A) $M/10$ B) $M/40$ C) $M/30$ D) $M/20$

17.4. If $A=20$ (from his point of view) and $R=10$ in Gainesville, which of the following defines the income needed in Gainesville to place him at the level of utility he received in Miami?
A) $M/10 = \ln(8.2)$ B) $M = 60000$ C) $\ln(M/30) = 8.2$ D) $\ln(M/2) = 4.1 + 0.5\ln(10)$

Questions 20.19 & 20

William's willingness to pay for q bottles of Sam Adams per week is $V(q) = 10\ln q$.

20.19. How many bottles does he drink each week if the price of Sam Adams is \$1 per bottle.
A) 20   B) 15   C) 10   D) 5

20.20. If price increases from \$1 to \$2, how much does his consumer surplus decline?
A) $10\big(\ln(10) - \ln(5)\big)$

B) $5\big(\ln(10) - 5\big)$

C) $\big(10\ln(10) - 10\big) - \big(10\ln(5) - 5\big)$

D) $10\ln(10) - 5\ln(5)$

Questions 21.16-20

Lewis is being relocated from Big City, where he currently earns $60,000 annually, to Medium City. His utility depends only on consumption of housing, H, and, how much money he has left after paying rent to spend on everything else, E. The annual rental cost of housing in Big City is $30 per square foot. At that price, he rents a 1,000 square foot home and spends $30,000 on other things. This is shown in the figure, where he is able to reach indifference curve I in Big City. In Medium City, the annual rental cost of housing is $10 per square foot.
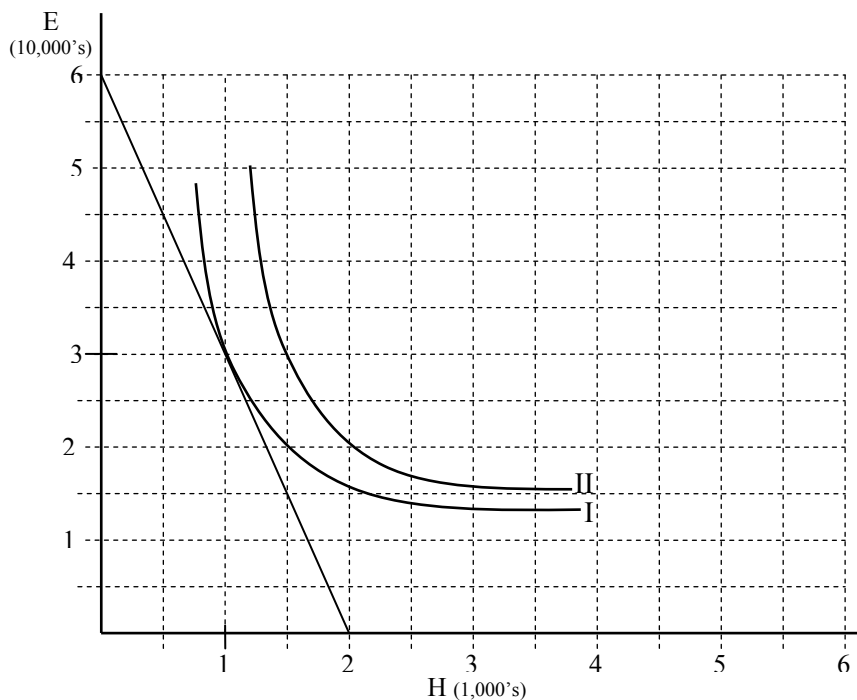
21.16. How much does the bundle that was initially chosen in Big City cost in Medium City?
A) 30,000   B) 35,000   C) 40,000   D) 45,000

21.17. At the bundle chosen in Big City, but the housing price of Medium City, which is true?
A) Lewis is willing to give up more of everything else for another unit of housing than it costs.
B) Lewis is willing to give up less of everything else for another unit of housing than it costs.
C) The marginal utility of H is 10 times the marginal utility of E.
D) The marginal rate of substitution of H for E equals 10.

21.18. Assuming no amenity differences, how much must Lewis earn in Medium City to reach the level of utility he enjoyed in Big City (indifference curve I)?
A) 30,000   B) 35,000   C) 40,000   D) 45,000

21.19. Now assume the amenity level is higher in Big City. Lewis must reach indifference curve II in Medium City to enjoy the utility level afforded by indifference curve I in Big City. How much must Lewis earn in Medium City to reach the level of utility he enjoyed in Big City?
A) 30,000   B) 35,000   C) 40,000   D) 45,000

21.20. If Lewis makes just enough to reach indifference curve II in Medium City (the answer to the previous question), how many square feet of housing does he consume?
A) 500   B) 1,000   C) 1,500   D) 2,000

X (1000's)

26. Alyssa is considering relocating from Sunnytown, Florida to Well Digger's Bum (WDB), Minnesota, due to a job offer. She consumes sunshine, housing (H), and other stuff (X). The price of X is $1 per unit in Sunnytown. The price of H is $1 per square foot monthly in Sunnytown. Due to the rural location, land is cheaper in WDB, but it costs more to ship in building supplies and to build a house resistant to the elements, so the price of H is $1 in WDB, too. However, the price of X is 1.5 times higher in WDB than in Sunnytown. The figure to the right shows her current indifference curve in Sunnytown, labeled S. Due to reduced sunshine consumption in WDB, she would have to reach the indifference curve labeled W to attain the same utility in WDB as she currently gets in Sunnytown. What is the lowest possible monthly salary she would accept to relocate?
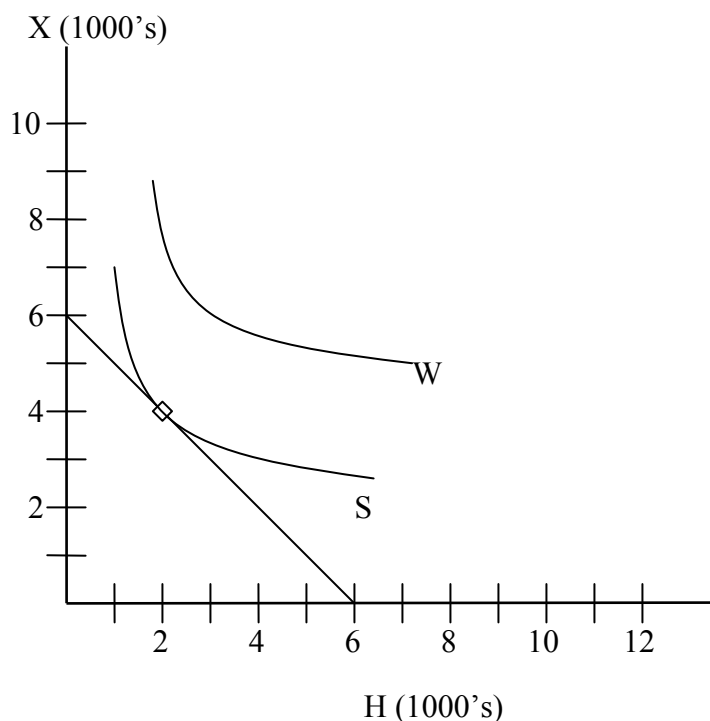
A) 8,000   B) 9,000   C) 10,000   D) 12,000

11.37. Suppose a firm with marginal cost of $1 serves one type of consumer with inverse demand given by $p = 9 - 2q$ (for a single consumer). If the firm charges the profit maximizing two part price, what is the fixed fee?

A) 8   B)   36   C)   20   D)   16

Questions 11 & 12
A firm with a constant marginal cost of $4 sells to identical consumers with total willingness to pay given by $V(q) = 16q - 0.25q^3$.

13.11. The consumers' individual inverse demand functions are

A) $p(q) = 16q - 0.75q^2$ B) $p(q) = 32 - 0.5q^2$ C) $p(q) = 16 - 0.5q$ D) $p(q) = 16 - 0.75q^2$

13.12. If the firm uses 2-part pricing and maximizes profit, the fixed fee is

A) 8   B) 16   C) 32   D) 48

2.11. Suppose a firm with marginal cost of $1 serves one type of consumer with inverse demand given by $p = 9 - 2q$ (for a single consumer). If the firm charges the profit maximizing two part price, what is the fixed fee?

A) 36   B) 20   C) 16   D) 8   E) none of the above

6.38.   Jane sells thingamajigs to 100 identical customers. Each customer's willingness to pay is given by $V(q) = 42q - \frac{2}{3}q^3$ (so consumer surplus with a constant per unit price is $CS(q) = 42q - \frac{2}{3}q^3 - pq$). Jane's constant marginal cost is $10. If she charges a profit maximizing 2-part pricing, what is the fixed fee?

A) $0 to $99   B) $100 to $199   C) $200 to $299   D) $300 or more

Questions 11-14
Brett sells thingamabobs to two types of consumers. There are 10 type 1 customers and 20 type 2 customers. Type 1's willingness to pay is given by $V_1(q_1) = 28q_1 - \frac{q_1^3}{3}$ and type 2's willingness to pay is $V_2(q_2) = 14q_2 - \frac{q_2^3}{3}$. Thingamabobs cost Brett $3 per unit to produce.

10.11.   Suppose Brett can separate the customers by type and charge them differently. Further suppose he implements block pricing, offering different size packages and prices to the two types, only allowing each type to buy the package meant for them. How many units does he include in the bundle or package he sells to type 1 customers?

A) 2   B) 3   C) 4   D) 5

10.12.   Continuing to assume that Brett can separate the customers and charge them differently, but now suppose Brett implements two part pricing, charging a per unit price and a fixed fee for the right to purchase the product. What is the fixed fee charged to type 1 customers?

A) 28   B) 83.33   C) 98.33   D) 109.33

10.13.   Now assume Brett can not separate the customer types. Instead, he engages in menu pricing, offering 2 bundles with different numbers of units at different total prices. Which of the following are the binding participation and selection constraints he must satisfy to ensure that each type purchases the package intended for them.

A) $V_1(q_1) - P_1 = 0$ and $V_2(q_2) - P_2 = V_2(q_1) - P_1$
B) $V_1(q_1) - P_1 = 0$ and $V_1(q_1) - P_1 = V_1(q_2) - P_2$
C) $V_2(q_2) - P_2 = 0$ and $V_2(q_2) - P_2 = V_2(q_1) - P_1$
D) $V_2(q_2) - P_2 = 0$ and $V_1(q_1) - P_1 = V_1(q_2) - P_2$

10.14.   How many units are in the bundle designed for the type 2 customer?

A) 1   B) 2   C) 3   D) 4

16.18. Jake's total willingness to pay for Burrito Brother's burritos is given by $V = 6q^{0.5}$. If the marginal cost of a burrito is constant at \$2, all customers were just like Jake, and fractional burritos are not possible, the block price for the profit maximizing bundle of burritos to package together would be:
A) impossible to calculate with the information given.   B) 8.48.   C) 10.00.   D) 7.51.

18.5. Jake's total willingness to pay for Burrito Brother's burritos is given by $V = 8q - q^2$. If the marginal cost of a burrito is constant at \$2 and all customers were just like Jake, the block price for the profit maximizing bundle of burritos to package together would be
A) 16.   B)   15.   C)   10.   D)   12.

Questions 20-23 Brett sells thingamabobs to two types of consumers. There are 5 type 1 customers and 5 type 2 customers. Type 1's willingness to pay is given by $V_1(q_1) = 28q_1 - \dfrac{q_1^3}{3}$ and type 2's willingness to pay is $V_2(q_2) = 20q_2 - \dfrac{q_2^3}{3}$. Thingamabobs cost Brett \$4 per unit to produce.

14.20. Suppose Brett can separate the customers by type and charge them differently. Further suppose he implements block pricing, offering different size packages and prices to the two types, only allowing each type to buy the package meant for them. How many units does he include in the bundle or package he sells to type 2 customers?
A) 4   B)   3   C)   2   D)   5

14.21. Continuing to assume that Brett can separate the customers and charge them differently, but now suppose Brett implements two part pricing, charging a per unit price and a fixed fee for the right to purchase the product. What is the fixed fee charged to type 2 customers?
A) 42.67   B)   24.81   C)   53.78   D)   74.33

14.22. Now assume Brett can not separate the customer types. Instead, he engages in menu pricing, offering 2 bundles with different numbers of units at different total prices. Which of the following are the binding participation and selection constraints he must satisfy to ensure that each type purchases the package intended for their type?
A) $V_1(q_1) - P_1 = 0$ and $V_2(q_2) - P_2 = V_2(q_1) - P_1$
B) $V_1(q_1) - P_1 = 0$ and $V_1(q_1) - P_1 = V_1(q_2) - P_2$
C) $V_2(q_2) - P_2 = 0$ and $V_2(q_2) - P_2 = V_2(q_1) - P_1$
D) $V_2(q_2) - P_2 = 0$ and $V_1(q_1) - P_1 = V_1(q_2) - P_2$

14.23. With menu pricing, the quantity in the bundle designed for the type 2 customer is
_____ the quantity that equates the marginal benefit to that type consumer with marginal
production cost?
A) equal to   B) greater than   C) less than   D) inversely proportional to

Questions 1-2
Jonathan's utility function is $U = 40P + 40B - 0.5P^2 - 0.5B^2$, where P is his weekly
consumption of pizza and B is his weekly consumption of beer. His budget is $40. When the
price of beer is $2 and the price of pizza is $2, he chooses 10 units of each and his utility is 700.

18.1. Suppose the price of pizza is $1 and the price of beer is $3. How much pizza and beer does
he buy?
A) P=10, B=10   B) P=28, B=4   C) P=8, B=16   D)   P=16, B=8

18.2. In city A the price of pizza is always $2 and the price of beer is always $2. In city B either
1) the price of pizza is $1 and the price of beer is $3 OR 2) the price of pizza is $3 and the price
of beer is $1, but which situation (1 or 2) actually occurs varies randomly from week to week,
with each price structure equally likely in any given week. Which of the following is true?
A) Risk aversion means Jonathan will prefer city A to city B.
B) Jonathan prefers city B to city A only if he is risk neutral.
C) Jonathan prefers city B to city A regardless of his attitude toward risk.
D) Jonathan's marginal rate of substitution is 1 in both cities.

13.13. With menu pricing for two consumer types, the charge for the large type's bundle
extracts consumer surplus just up to the point where
A) none is left for the large consumer, since that is where there is the most profit potential.
B) both consumer types get the same surplus, to equate marginal returns.
C) the large consumer will almost, but not quite, prefer the small bundle.
D) the small consumer is not tempted to buy the large bundle.

13.14. With menu pricing for two consumer types, the quantity in the small bundle
A) equates the small type's marginal willingness to pay and marginal cost.
B) creates the largest possible consumer surplus for the small type.
C) equates the small and large types' marginal willingness to pay.
D) leaves the small type's marginal willingness to pay greater than marginal cost.
7.3.   Compared to charging a constant price per unit, when it is possible to separate
    consumers into two distinct markets and resale is not possible, a firm with market power can
    increase profits by charging the group
a)   buying the most output a higher price, to contain costs.
b)   with the most elastic demand a higher price, because they respond least.
c)   with the least elastic demand a higher price, because they respond least.
d)   buying the least output a higher price, to contain costs.

Questions 52 – 54
A firm sells an identical product to two types of consumers with willingness to pay given by
$V_1(q_1) = 10\ln(q_1)$ and $V_2(q_2) = 4\ln(q_2)$ respectively. There is one type 1 consumer and there are
2 type 2 consumers. The firm can not directly segment the market, but, can offer different size
packages at differing prices (resale is not possible), tailoring a different package for each
consumer type. The constant marginal cost of output is $1. Let q_1 and P_1 represent the size and
price of the package intended for the single type one consumer. (So P_1 is not the price per unit,
but rather the price of q_1 total units.) Similarly, P_2 and q_2 represent the price and size of a
package intended for each type 2 consumer.

6.52.   What are the binding participation and selection constraints?
A) $10\ln(q_1) - P_1 = 0$ and $10\ln(q_1) - P_1 = 10\ln(q_2) - P_2$
B) $4\ln(q_2) - P_2 = 0$ and $10\ln(q_1) - P_1 = 10\ln(q_2) - P_2$
C) $10\ln(q_1) - P_1 = 0$ and $4\ln(q_2) - P_2 = 4\ln(q_1) - P_1$
D) $4\ln(q_2) - P_2 = 0$ and $4\ln(q_2) - P_2 = 4\ln(q_1) - P_1$

6.53.   What is the optimal q_1?
A) 0 to 4.99   B) 5 to 9.99   C) 10 to 14.99   D) 15 or above

6.54.   What is the optimal q_2?
A) 0 to 4.99   B) 5 to 9.99   C) 10 to 14.99   D) 15 or above

16.19. In a menu pricing problem with two types of customers who cannot be explicitly
separated, the participation constraint binds for the _____ demand consumer and the
selection constraint binds for the _____ demand consumer.
A) high : high   B) high : low   C) low : high   D) low : low

16.20. In a menu pricing problem with two types of customers who cannot be explicitly
separated, the quantity in the bundle for the high demand consumer is _____ it would be
with compete information, and the quantity in the bundle for the low demand consumer is

_____.
A) the same as : lower   B) higher than : the same
C) the same as : higher   D) higher than : lower

Questions 11 & 12
Alex sells widgets to large customers with total willingness to pay given by $10q^{0.5}$ and small
customers with total willingness to pay given by $8q^{0.5}$. There are 100 customers of each type.
Marginal cost is 1. He offers a profit maximizing menu of block prices.

25.11. What is the size of the bundle for the large type customer?
A) 8   B) 9   C) 25   D) 50

25.12. What is the size of the bundle offered to the small type customer?
A) 8   B) 9   C) 25   D) 50

Chapter 10. UNCERTAINTY WITH RISK AVERSION

TRUE FALSE

25.27. Insurance companies exist because individuals tend to make errors evaluating complex lotteries.
A) True   B) False

25.28. Insurance creates value if it is possible to pool together large numbers of largely independent risks.
A) True   B) False

25.29. The Endowment Effect refers to the tendency to place additional sentimental value on items that have been in one's possession for extended periods of time.
A) True   B) False

3.5. One challenge to the use of expected utility as a model of economic behavior is that repeated experiments have found that individuals often do not formulate consistent subjective probabilities in the face of ambiguous uncertainty.

5.2. One challenge to the use of expected utility as a model of economic behavior is that repeated experiments have found the framing of identical options affects choices.

21.4. The Allais Paradox points to preferences that do not satisfy the independence axiom.

21.5. The endowment effect refers to the tendency for individuals to overestimate the market value of items to which they have formed sentimental attachments.

21.6. Risk aversion has to do with the curvature of the utility function, not the scale.

21.15. When an insurance company increases the number of wind insurance policies they write in a given city, they are in essence diversifying away risk.

22.42. Joe spends equal amounts on beer and pizza. The price of pizza increases to 1.5 times its previous level and the price of beer falls to half its previous level. Joe is definitely better off after the change if his preferences satisfy standard assumptions.

22.44. The certainty equivalent is independent of the scale of the expected utility function.

22.45. The Ellesberg paradox shows individual preferences do not satisfy the transitivity assumption.

23.9. The independence axiom states that the certainty equivalent is independent of the risk free rate of return.

23.10. The expected utility model treats choices over lotteries as if they are equivalent to choosing the option with the highest expected utility of wealth.

24.1. The certainty equivalent of a risky gamble is the risk free wealth that would give the same expected utility as the risky gamble.

24.2. For a risk averse individual facing uncertainty, expected utility is less than the utility of expected wealth.

24.3. An insurance company adds more value if they specialize in insuring only customers that face common highly correlated risks, for example only customers in south Florida that are exposed to the same hurricanes.

MULTIPLE CHOICE

19.11. A lottery pays $100 with probability 0.1 and nothing otherwise. Which of the following is true of a risk averse individual's willingness to pay for a ticket?
A) They are willing to pay up to $10, since that is the expected value.
B) They are willing to pay less than $10 but more than $0.
C) They would not be willing to buy a ticket for any price, since they are risk averse.
D) They would buy many tickets to diversify the risk.

6.43.   Frank runs a Drag Racing School at Gainesville Raceway. A normal two day class for becoming an NHRA licensed Super Comp driver costs $1,700. If a student crashes the race car, he must pay a $5,000 premium to the insurance company for repairs. Frank also offers an additional insurance program for $100 extra. If a student buys the additional insurance and crashes the car, he must only pay a $1,000 premium for repairs. Suppose a typical student has a wealth of $50,000 after paying for the course and has preferences for gambles that can be represented by the utility function $u(w) = w^5$. What is the probability that a student believes he will crash that makes him indifferent between buying the additional insurance and not buying the additional insurance? You should carry at least 2 decimal places for your calculations – while the problem is not picky about rounding, the numbers are not nice and round.
A) 0 to 1.99%   B) 2 to 2.24%   C) 2.25 to 2.49%   D) 2.50% or more

7.33.   The Ellsberg and Allais paradoxes:
a)   Show individuals prefer subjective to objective probabilities.
b)   Indicate rational decision processes sometimes give rise to paradoxical behavior.
c)   Demonstrate the irrelevance of the independence axiom.
d)   Indicate some limitations of modeling individual behavior with expected utility theory.

9.13.   Many people claim they would choose $1 million for sure over a lottery with a 1% chance of $0, an 89% chance of $1million, and a 10% shot at 5 million. Man of those same people also claim they would choose a lottery with a 10% chance at $5 million and a 90% chance of $0 over a lottery with an 11% chance of $1 million and an 89% chance of $0. This behavior appears to indicate a violation of the _____ assumption.

A) more is better   B) independence   C) diminishing MRS   D) completeness

6.48.   There are 100 colored marbles in a bag. It is known that 25 of them are green and the remaining 75 are either orange or blue. You are offered a choice between lottery I and lottery II, where the prize for winning in either case is one ticket to the BCS championship game in Glendale. You may choose only one option. The two lotteries are as follows:

Lottery I: Draw an orange marble from the bag and win, draw any other color and you do not win.
Lottery II: Draw a green marble from the bag win, draw any other color and you do not win

You are also offered a choice between lottery III and lottery IV with the same prize. You may choose only one option. The two lotteries are as follows:

Lottery III: Draw a green or blue marble from the bag and you win, draw an orange marble and you do not win.
Lottery IV: Draw an orange or blue marble from the bag and you win, draw a green marble and you do not win.

Which of the following represents choices fully consistent with the subjective expected utlity model of individual decision making in the face of uncertainty?
A) I and III or II and IV
B) I and IV or II and III
C) I and III or II and III
D) I and IV or II and IV

Questions 30-31.   Mario's utility function for wealth in the face of uncertainty is given by $u(w) = w^{.5}$. Mario's wealth is initially $400, but, there is a 10% chance a hurricane will cause a loss of $300.

7.30.   What is the certainty equivalent of Mario's gamble?
   a)   19   b)   20   c)   361   d)   370

7.31.   Ignoring administrative costs, how much economic value would be created if Mario were fully insured?
a)   4   b)   9   c)   19   d)   30

11.24. 1,000 identical individuals with an initial wealth of $100 face a 0.2 probability that an accident will occur that reduces wealth to $0. All risks are independent. The certainty equivalent of the individual's gamble is $64. It costs $2 to write each policy. What is the value created by insuring these 1,000 individuals?
A) 20,000   B)   14,000   C)   16,000   D)   2,000

14.31. 20 identical individuals with an initial wealth of $500 face a 0.1 probability that an accident will occur that reduces wealth to $100. All risks are independent. The certainty equivalent of the individual's gamble is $300. It costs $10 on average to write and service each policy. What is the value created by insuring these 20 individuals?

A) 1,500   B) 3,000   C) 5,000   D) 6,000

17.6. Shelly has to choose between gamble A which offers a prize of $100 for winners and gamble B which offers a prize of $90 for winners. The probability of winning gamble B is known by everyone to be 0.5. No one knows the probability of winning gamble A, but Shelly thinks it is 0.6. Shelly chooses A. This is an example of the _____ paradox.

A) value   B)   Allais   C)   St. Petersburg   D)   Ellsberg

17.7. The endowment effect
A) occurs when traders are endowed with less risky lotteries.
B) is less likely with more experienced traders.
C) is more likely as the risk premium rises.
D) occurs when traders become sentimentally attached to inanimate items.

17.8. Consider the four lotteries summarized in the table to the right. Suppose Haley must choose between A and B and also choose between C and D. Which of the following preferences would likely represent a violation of the independence axiom?

	Probabilities of Each Payoff			
Payoff	**A**	**B**	**C**	**D**
$0	0.15	0	0.6	0.75
$1,000	0.7	0.95	0.35	0.1
$5,000	0.15	0.05	0.05	0.15

A) $B \succ A$ and $C \succ D$ B) $A \succ B$ and $C \succ D$
C) $A \sim B$ and $C \sim D$ D) $A \succ B$ and $D \succ C$

Questions 12-14
Alex's utility function is $u = w/(20 + w)$, his initial wealth is $100 and he faces a 0.2 chance of losing $50. There are 10,000 customers just like him. The insurance industry is perfectly competitive, administrative costs are $1 per policy, and all risks are independent.

17.12. The certainty equivalent of Alex's gamble is ____.
A) 90   B)   85   C)   80   D)   95

17.13. The price of an insurance policy is ____.
A) 1   B)   51   C)   11   D)   21

17.14. The value created by the insurance industry is ____.
A) 40,000   B)   30,000   C)   60,000   D)   50,000

18.3. Consider the four lotteries summarized in the table to the right. Suppose Haley must choose between A and B and also choose between C and D. Which of the following preferences is consistent with the expected utility model?

A) $B \succ A$ and $C \succ D$
B) $A \succ B$ and $C \succ D$
C) $A \sim B$ and $C \succ D$
D) $B \succ A$ and $D \succ C$

Payoff	Probabilities of Each Payoff			
	A	B	C	D
$0	0.15	0	0.6	0.75
$1,000	0.7	0.95	0.35	0.1
$5,000	0.15	0.05	0.05	0.15

Questions 6-8

Jake's utility function is $u = 1 - \dfrac{10}{w}$ and his initial wealth is $100. In scenario I he faces a 0.2 probability he will lose $40 of his wealth due to storms, fires, or other catastrophes, and a 0.2 probability he will lose $80 of his wealth. In scenario II he faces faced a 0.4 probability of losing $40 and a 0.1 probability of losing $80. The insurance industry is perfectly competitive. There are no differences in administrative and transactions costs between scenarios I and II.

18.6. Expected monetary losses in scenario I are _____.
A) 24   B)   20   C)   32   D)   18

18.7. The certainty equivalent of Jake's lottery in scenario II is _____.
A) 70   B) 50   C) 40   D) 60

18.8. Which of the following is true?
A) The value of insurance is higher in scenario I because there is an equally higher chance of both of the extreme outcomes (no loss or a large loss).
B) The value is the same in I as in II because the utility function can be renormalized.
C) The value of insurance is higher in scenario II because there is less chance of incurring no losses.
D) The value is the same in I as in II for any expected utility function.

Questions 21.21-25 share information
21.21. Stephanie's utility function is $u(w) = w^{0.5}$. She faces a choice between options A and B. A yields $4 with probability 0.5 and $49 otherwise. B yields $16 for certain. Which is true?
A) $A \succ B$ B) $B \succ A$ C) $A \sim B$ D) She is risk neutral.

21.22. Suppose instead Stephanie's initial wealth is $100 and she faces a 0.2 probability of a $36 loss and a 0.1 probability of an $84 loss. What is Stephanie's expected wealth?
A) 72.25   B) 81.00   C) 84.40   D) 92.16

21.23. What is the certainty equivalent of the lottery in the previous question?
A) 72.25   B) 81.00   C) 84.40   D) 92.16

21.24. Suppose there are 1000 individuals with the same utility function as Stephanie, and, with the same initial wealth and risk profile as in the two questions above. Risks are independent across individuals and the administrative costs of an insurance policy are $0.4 per policy. If the insurance industry is perfectly competitive, what is the price of a policy?
A) 15.2   B) 16.0   C) 18.4   D) 24.6

21.25. What is the value added by the insurance industry in the previous question?
A) 1,500   B) 2,550   C) 2,950   D) 3,000

Chapter 11. MORE ON PRODUCTION AND COST

TRUE FALSE

4.6.   If the marginal product of an hour of labor is 40, the marginal product of an hour of capital usage is 20, and the hourly wage rate is $10, then, cost could be reduced by using more capital if the cost of capital usage was $8 per hour or below.

4.7.   If the marginal product of an hour of labor is 10, the marginal product of an hour of capital usage is 30, the hourly wage rate is $20, and the cost of capital usage is $50 per hour, then cost could be reduced by using more capital.

6.8.   The marginal cost of producing another unit of output using the most cost effective input must be less than the marginal cost of producing another unit of output using other inputs; otherwise you are not effectively identifying the most cost effective production process.

Questions 24.14-24.15 (Topic 6)
A firm runs two plants, A and B. Plant A has a constant marginal cost of 5 and a start up cost of 200. Total variable cost in plant B is $TVC_B = 0.05q_B^2$, and it costs 100 to start up plant B.

24.14. If start up costs are sunk in both plants and total output is 200, 50 units should be produced in plant B to minimize costs.

24.15. If start up costs in plant A have not yet been sunk, plant A should never be opened.

25.32. If Vlad optimally chooses a more labor intensive production process in his South American operation than in his Asian operation, then it must be the case that the marginal product of labor is higher in South America than in Asia.
A) True   B) False

23.8. The LaGrangian technique is basically a way to set up a constrained optimization problem so it can be solved in the same way as an unconstrained optimization problem.

MULTIPLE CHOICE

2.1. Suppose a manager is using both skilled and unskilled labor. The marginal product of skilled labor is 30, the wage of skilled labor is $50, the marginal product of unskilled labor is 6, and, the wage of unskilled labor is 8. Which of the following is true?
A) Using more unskilled labor and less skilled labor could produce the same output more cheaply.
B) Using more skilled labor and less unskilled labor could produce the same output more cheaply.
C) Without additional information to determine the MRTS, we can not tell if cost is minimized.
D) Without also knowing VMP_K and VMP_L, we can not tell if cost is minimized.
E)   none of the above

3.48.   The marginal product of labor is 150 and the marginal product of capital is 200. The wage rate is $15 and the price of capital is $10. What is the marginal cost of an additional unit output using each input, and which input will produce anther unit most inexpensively?
A) MC using labor is 10; MC using capital is 20; Labor produces another unit of output at the least expense.
B) MC using labor is $.1; MC using capital is $.05; Capital produces another unit of output at the least expense.
C) MC using labor is $.05; MC using capital is $.1; Labor produces another unit of output at the least expense.
D) MC using labor is 20; MC using capital is 10; Capital produces another unit of output at the least expense.

2.19. Which of the following *must* be true to minimize the total cost of producing a given level of output when a firm has two plants?
I.   If fixed costs are not sunk, production should occur in the plant with the lowest marginal cost.
II.   If fixed costs are sunk, output should be allocated across plants to equalize marginal costs between plants.
III.   For sufficiently low outputs, if fixed costs are large, are not sunk, and differ dramatically, production should occur in the plant with the lowest fixed cost, even if it has a higher marginal cost.
IV.   For very high outputs, if fixed costs are small, are sunk, and are similar, all production should occur in the plant with the lowest marginal cost for any given total output.
A)   I and II   B) II and III   C) II and IV   D) I and IV   E) none of the above

3.47.   Veronica produces thingamabobs in two plants. The cost in plant A is given by $C_A(q_A) = 10 + .5q_A + .05q_A^2$, where the fixed cost component is sunk. The cost in plant B is given by $C_B(q_B) = 20 + .25q_B$ if the plant is in production. Otherwise, the cost is 0, so the fixed is not sunk. If 15 units are produced, how much should be produced in plant B to minimize cost?
A) 0   B) 5   C) 7.5   D) 10   E)   15

Questions 16 & 17
Billy Bob produces gadgets in two plants. If plant A is brought online, cost in plant A is $50 + 4q_A^2$. If plant A is not brought online, cost is 0 in plant A. In plant B, cost is given by $100 + 4q_B^2$ whether or not plant B is used.

4.16.   What is the minimum cost of producing 4 units?
A) 182   B) 132   C) 114   D) 164

4.17.   At what output level does it become worthwhile to run both plants?
A) 5   B) 10   C) 4   D) 2

6.41.   Assume a firm has a marginal product of labor of 40, a marginal product of capital of 100, an hourly wage rate of $10, and an $8 cost of capital. What should be done to reduce cost holding output constant?
A) Use more capital and less labor
B) Use more labor and less capital
C) Keep capital and labor usage unchanged
D) Compute the ratio of VMP_L to VMP_K and adjust the capital labor ratio to the same level.

7.44.   The marginal product of labor is 150 and the marginal product of capital is 200. The wage rate is $15 and the price of capital is $10. The marginal cost of an additional unit output using labor is _____, using capital is _____, and _____ will produce anther unit most inexpensively?
a) 0.1, 0.05, capital   b) 10, 20, labor   c) 0.05, 0.1, labor   d) 20, 10, capital

7.45.   Which of the following minimizes the total cost of producing a given level of output when a firm has two plants, both of which incur start up costs when they are brought online?
a)   Production should occur in the plant with the lowest marginal cost.
b)   Output should be allocated across plants to equalize marginal costs between plants at all output levels.
c)   For sufficiently low outputs, production should occur in the plant with the lowest start up cost, even if it has a higher marginal cost.
d)   For sufficiently high outputs, all production should occur in the plant with the highest start up cost, as long as the marginal cost is increasing with output.

Questions 8 and 9

Allan produces in two plants. Cost in plant 1 is given by $C_1 = 10 + 0.005q_1^2$, where the $10 fixed cost is sunk. The cost in plant 2 is given by $C_2 = 10 + 0.5q_2$, where the $10 fixed cost is only incurred if output is actually produced in plant 2.

8.8   How much is produced in plant 1 to minimize total cost if 40 total units are produced?
A) 0   B) 25   C) 40   D) 50

8.9.   How much is produced in plant 1 to minimize total cost if 60 total units are produced?
A) 0   B) 25   C) 50   D) 60

11.13. Henrique produces in two plants. Cost in plant 1 is given by $C_1 = 5 + 0.05q_1^2$, where the $5 fixed cost is sunk. The cost in plant 2 is given by $C_2 = 5 + 0.5q_2$, where the $5 fixed cost is only incurred if output is actually produced in plant 2. How much is produced in plant 2 to minimize total cost if 7 total units are produced?
A) 5   B)   6   C)   2   D)   0

12.1. According to the replication argument, which of the following should not exist?
A) Compensating differentials   B) Equivalent markets
C) Diseconomies of scale   D) Perfect quality control

12.2. If average cost is decreasing as quantity increases
A) marginal cost MUST be greater than average cost
B) total cost is falling
C) falling average fixed costs are swamping increasing average variable costs
D) marginal cost MUST be less than average cost

12.4. Compared to the long run, in the short run average cost is _____ for a given output and price elasticity of demand is _____ for a given price.
A) higher, higher   B) higher, lower   C) lower, higher   D) lower, lower

12.14. In plant A, all start up costs are sunk and marginal cost increases with output. In plant B, marginal cost is constant but relatively high and significant start up costs are not yet sunk. Which of the following is true?
A) Output should be distributed to equalize marginal cost between plants, for all total output levels.
B) Nothing should ever be produced in plant B since it has both a start up cost AND a relatively high marginal cost.
C) Output should be distributed to equalize marginal cost between plants, but only for high levels of total output.
D) For high output levels, only B should be used, because marginal cost is increasing in A but constant in B.

Questions 30-31
Megan is trying to allocate production between two plants. Marginal cost is $5 in Plant A, with no start-up cost. Total variable cost in Plant B is $0.1q_B^2$ with a start up cost of X.

25.30. What is the most that should be produced in Plant B?
A) 25   B) q/5   C) q/2   D) 50

25.31. Which of the following determines the smallest quantity at whichPlant B should be opened?
A) $X + 0.1q^2 = 5q$ B) $0.2q = 5$ C) $0.1q = 5$ D) $X + 0.2q^2 = 5q$

13.6. Cost in plant A is $C_A(q_A) = 2q_A + .25q_A^2$ and cost in plant B is $C_B(q_B) = 20 + 6q_B$, where the $20 fixed cost is only incurred if the plant is in fact used. If 12 units are produced, how much should be produced in plant A?
A) 0   B) 4   C) 8   D) 12

14.11. The marginal product of labor is 15 and the marginal product of capital is 2. The wage rate is $30 and the price of capital is $0.5. Then the marginal cost of an additional unit output using labor is _____, using capital is _____, and more _____ and less _____ should be used to minimize cost holding output constant?
A) 0.5, 4, capital, labor   B)   7.5, 60, labor, capital
C) 2, 0.25, capital, labor   D)   0.5, 4, labor, capital

15.9. The figure to the right shows combinations of capital (K) and labor (L) that can produce 20 units (q=20) and combinations that cost $50. The price of labor is w and the price of capital is r. At point a, which of the following is true?
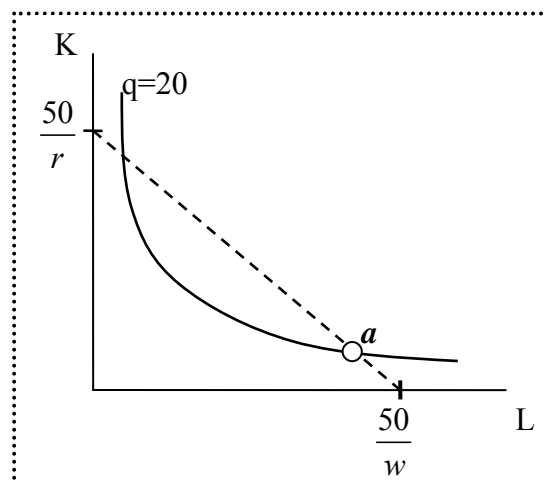
A) $MP_L < MP_K$

B) $MRTS_{LK} = w/r$

C) $MP_L/w > MP_K/r$

D) $MRTS_{LK} < w/r$

15.10. Various combinations of capital (K) and labor (L) capable of producing any number of units (q) are approximated by $q = \dfrac{K^2L}{4}$. The price of labor (w) is 9 and the cost of capital (r) is 3. What capital to labor ratio (K/L) would minimize cost?

A) 9   B)   6   C)   3   D)   1

15.11. John's firm currently operates one plant and is planning a second. When the first plant is running at full capacity, it operates in a range of increasing marginal cost. The marginal product of a unit of capital is 20 and the marginal product of a unit of labor is 6. The cost of a unit of capital input is $120 and the cost of a unit of labor input is $30. If John expects current capital and labor costs to continue, which of the following is true?

A) The information is insufficient to answer the question.

B) The second plant should be less capital intensive than the first.

C) The second plant should be more capital intensive if decreasing returns to scale are expected.

D) The second plant should be more capital intensive than the first.

15.12. Alex operates 2 plants. Cost in plant A is given by $C_A = 1000 + 0.5q_A^2$, where the $1000 fixed cost is sunk. Cost in plant B is given by $C_B = 100 + 10q_B$, where the $100 fixed cost is incurred only when plant B is fired up. What is the minimum total cost of producing 20 units?

A) 1200   B)   300   C)   1300   D)   1250

15.13. The "replication argument" holds that

A) replication of fixed costs erodes profits if minimum efficient scale has not been reached.

B) diseconomies of scale result from replicated start up costs.

C) economies of scope are sustained by replicating cost complementarities.

D) diseconomies of scale should never actually occur.

18.14. Which of the following *must* be true to minimize the total cost of producing a given level of output when a firm has two plants?
A) If fixed costs are not sunk, all production should occur in the plant with the lowest marginal cost for any given total output.
B) Output should be allocated across plants to equalize marginal costs between plants.
C) For very high outputs, if all fixed costs are sunk, all production should occur in the plant with the lowest marginal cost for any given total output.
D) For sufficiently low outputs, if fixed costs are not sunk all production should occur in the plant with the lowest fixed cost.

19.2. Which of the following statements about cost are true?

I. Average cost is equal to marginal cost at the minimum point on the marginal cost curve.
II. The average cost of a given output is generally lower in the long run than in the short run.
III. If the wage rate increases more labor should be used because it is more productive.
IV. The isoquants of two inputs that are perfect substitutes are linear.

A) I, II　　　　B) I, III　　　　C) II, IV　　　　D) I, II, IV

19.9. Short run marginal cost is increasing because of
A) the presence of a fixed factor.
B) the limited ability to govern large organizations.
C) diminishing specialization.
D) market saturation.

19.10. Suppose a cost of $1,000 can be avoided by shutting down production (in which case total cost is $0) but is constant (fixed) no matter how much is produced otherwise. Then this is
A) a short run scenario, since there is a fixed cost.
B) a long run scenario, since costs are 0 if the firm shuts down.
C) an intermediate run scenario, since there is a fixed cost unless the firm shuts down.
D) an inconsistent cost function.

22.4. Allison operates 2 plants. Cost in plant A is given by $C_A = 1000 + 2q_A^2$, where the $1000 fixed cost is sunk. Cost in plant B is given by $C_B = 100 + 20q_B$, where the $100 fixed cost is incurred only when plant B is fired up. What is the minimum total cost of producing 20 units?
A)　1800　　　　　B)　　1450　　　　C)　　1400　　　　D)　　2400

22.5. Anne's firm currently operates one plant and is planning a second. When the first plant is running at full capacity, it operates in a range of increasing marginal cost. The marginal product of a unit of capital is 10 and the marginal product of a unit of labor is 6. The cost of a unit of capital input is $90 and the cost of a unit of labor input is $60. If she expects current capital and labor costs to continue, which of the following is true?
A)　The information is insufficient to answer the question.
B)　The second plant should be less capital intensive than the first.
C)　The second plant should be more capital intensive if increasing returns to scale are expected.
D)　The second plant should be more capital intensive than the first.

CHAPTER 12 and 13 - ONE SHOT GAMES

TRUE FALSE

3.17. A simultaneous move game is one in which each player makes decisions without knowing what the other player does.

3.18. A dominant strategy is any strategy that results in the highest payoff against at least one of the opponent's strategies.

4.4.   If a game has one or more pure strategy Nash equilibria, at least one involves the players playing their secure strategies.

4.5.   If a player has a strongly dominant strategy, it is also a secure strategy.

6.9.   A finite game with any number of players always has at least one Nash equilibrium.

Questions 24.16-24.17
There is only time left for 1 more play in the SEC championship game. The team on offense is behind by 5 points but has the ball on the opponent's 4 yard line. The offensive coordinator (O) and defensive coordinator (D) must decide if their teams will go with a run or pass orientation on the last play. The probabilities of a win are the payoffs, and they are dictated by the choices made as shown in the table to the right.

		Defense	
		Run	Pass
Offense	Run	O: 0.4 D: 0.6	O: 0.7 D: 0.3
	Pass	O: 0.8 D: 0.2	O: 0.5 D: 0.5

24.16. In the Nash equilibrium, the probability the defense sets up with a run orientation is 1/3.

24.17. In the Nash equilibrium, the probability the offense wins (their expected payoff) is 3/5.

MULTIPLE CHOICE

11.11. Which of the following statements about solutions to games it true?
A) At least one Nash equilibria involves a player's secure strategy.
B) The first mover has an advantage in sequential games.
C) If a strategy is both secure and part of a Nash equilibrium, it is dominant.
D) A weakly dominant strategy is always secure.

3.49.   Susan and Casey run competing restaurants. Both have many loyal customers, but, some customers would switch if the other restaurant's price was low enough. If Casey aggressively goes after the price conscious customers and Susan does not, Casey makes $40 and Susan makes a loss of $10 (that is -$10). If Susan aggressively pursues the price conscious customers, and Casey does not, Susan makes $30 and Casey makes a profit of $10. If both aggressively pursue the price conscious customers, both make $0. If neither is aggressive, both make $35. What is the pure strategy Nash equilibrium of this game if it is played only once?

A) Casey Aggressive; Susan Not Aggressive
B) Casey Aggressive, Susan Aggressive
C) Casey Not Aggressive; Susan Aggressive
D) Casey Not Aggressive; Susan Not Aggressive
E) The only Nash equilibrium is in mixed strategies

Questions 11-13 refer to the following information.
Mari hires Henrique to manage her business when she is on vacation. She pays him $100. If Henrique works hard, Mari's business will make $300 in profit. If he does not, the business makes only $200. Henrique perceives the cost of working hard to be $40. After Mari returns, she can punish Henrique if he did not work hard by spreading word that he is unreliable. Doing so costs Mari $10 and costs Henrique future profits with an expected present value of $200. Assume Mari and will never be in a similar situation again.

12.11. What happens in the subgame perfect equilibrium of this game?
A) Henrique works hard and Mari does not punish him.
B) Henrique does not work hard and Mari does not punish him.
C) Henrique does not work hard and Mari punishes him.
D) The players randomize play to be unpredictable.

12.12. What happens in the non-subgame perfect equilibrium of this game?
A) Henrique works hard and Mari does not punish him.
B) Henrique does not work hard and Mari does not punish him.
C) Henrique does not work hard and Mari punishes him.
D) The players randomize play to be unpredictable.

12.13. Now assume Mari will not interact with Henrique again, but she will hire someone every year during her vacation. How high must Henrique think the probability of punishment is to get him to work hard?
A) 0.1   B) 0.2   C) 0.25   D) 0.5

Questions 9 & 10
Sarah and Alexandria play the game defined by the normal form representation below.

		Sarah	
		Left	Right
Alexandria	Top	A: 40 S: 20	A: 20 S: 40
	Bottom	A: 10 S: 10	A: 20 S: 20

1.9.   How many pure strategy Nash equilibria does this game have?
A) 4   B) 3   C) 2   D) 1   E) none of the above

1.10.   Which of the following is true?
A) Alex has a strongly dominant strategy.
B) Both players have a strongly dominant strategy.
C) Sarah has a weakly dominant strategy.
D) Both players have a weakly dominant strategy.
E) none of the above

Questions 51 and 52
Dan hires Amy for one year, and one year only. If Amy works hard, Dan's payoff is $450 and
Amy's is $150. If Amy shirks, Dan's payoff is $100 and Amy's is $250. After the year is over,
Dan can punish Amy if she shirks by going out of his way to make sure she has a hard time
finding other work that pays well. Inflicting this punishment costs Dan $50 and costs Amy $400.
The costs of punishment are in addition to other payoffs. Dan and Amy are both risk neutral.

3.51.   What is the sub-game perfect Nash equilibrium of this game if it is played once, there
        is complete information, and everyone is rational?
A) Amy shirks; Dan does not punish.
B) Amy works hard; Dan does not punish.
C) Amy shirks; Dan punishes.
D) Amy works hard, Dan punishes.
E) The only Nash equilibrium is in mixed strategies.

3.52.   Now suppose Dan will have to hire a manager every year and there is some chance
        Dan is the kind of person who will always punish a shirking manager, no matter what. What
        is the minimum probability with which Amy might think Dan will punish her for shirking to
        induce her to work hard?
A) .1   B) .25   C) .33   D) .5   E) .75

6.57.   Dan hires Amy for one year. If Amy works hard, Dan's payoff is $450 and Amy's is $150. If Amy shirks, Dan's payoff is $100 and Amy's is $250. After the year is over, Dan can punish Amy if she shirks by going out of his way to make sure she has a hard time finding other work that pays well. Inflicting this punishment costs Dan $50 and costs Amy $400. The costs of punishment are in addition to other payoffs. Dan and Amy are both risk neutral. Further, suppose Dan will have to hire a manager every year and there is some chance Dan is the kind of person who will always punish a shirking manager, no matter what. What is the minimum probability with which Amy might think Dan will punish her for shirking to induce her to work hard?

a) 0 to 0.149   b) 0.15 to 0.299   c) 0.3 to 0.449   d) 0.45 or more

7.11. Brett and Meredith play a price competition game, the one shot version of which is represented by the normal form at right. What is true of the Nash equilibria of the one shot game?

		Brett	
		Aggressive	Accommodative
Meredith	Aggressive	M: 0 B: 0	M: 20 B: -10
	Accommodative	M: 10 B: 5	M: 15 B: 10

a) There are none.
b) There is one pure strategy Nash equilibrium.
c) The probability that Meredith is aggressive makes Meredith indifferent between being aggressive or not.
d) The probability that Meredith is aggressive makes Brett indifferent between being aggressive or not.

8.2.   Which of the following statements about reasonable solutions to games it true?
A) A secure strategy is always weakly dominant.
B) At least one Nash equilibria involves a player's secure strategy.
C) A weakly dominant strategy is always secure.
D) If a strategy is both secure and part of a Nash equilibrium, it is dominant.

8.3.   If Regina and John are playing a mixed strategy Nash equilibrium, the probabilities of various plays from Regina make _____ indifferent between the strategies _____ might select.
A) Regina, Regina   B) John, John   C) Regina, John   D) John, Regina

Questions 9 and 10 refer to the game at right.

12.9.　Which of the following is a secure strategy?

A) Up　　　B) Left　　　C) Middle　　　D) Right

		Player B		
		Left	**Middle**	**Right**
Player A	**Up**	A: 2 B: 3	A: 5 B: 8	A: 1 B: 0
	Down	A: 3 B: 4	A: 4 B: 1	A: 3 B: 5

12.10.　How many pure strategy Nash equilibria does the game have?

A) 0　　　　　　B) 1　　　　　　C) 2　　　　　　D) 3

15.1.　John and Barack each have a paintball gun pointed at the other at pointblank range. If one fires and the other doesn't, the one that fires gets satisfaction of +100 and the other gets satisfaction of -100. If both fire, they both get satisfaction of -50. If neither fires, they both get satisfaction of 0. What is the pure strategy Nash equilibr(ium/a) in the one shot game?

A)　Both Barack and John fire.
B)　Neither Barack nor John fire.
C)　Either Barack of John fire, but, not both.
D)　There are no pure strategy equilibria.

15.2.　Sam was offered a job where he must work with Ed. If Sam accepts the job and Ed works cooperatively with him, they each earn a payoff of 80. But, Ed does not like Sam and might refuse to cooperate. If Sam accepts the job and Ed does not cooperate, both Ed and Sam earn a payoff of 40. If Sam instead accepts another job offer, his payoff would be 50 and Ed would continue to work alone, making his payoff 100. What are the payoffs in the sub-game perfect Nash equilibrium of this game?

A)　Sam: 50, Ed: 100
B)　Sam: 80, Ed: 80
C)　Sam: 40, Ed: 40
D)　The equilibrium is in mixed strategies

Questions 27 & 28

Sarah and Alexandria play the game represented to the right.

18.27. How many pure strategy Nash equilibria does this game have when play is simultaneous?

A) 1　　　　　　B) 3　　　　　　C) 4　　　　　　D) 2

		Sarah	
		Left	Right
Alexandria	Top	A: 40 S: 20	A: 20 S: 10
	Bottom	A: 10 S: 10	A: 30 S: 30

18.28. If Alexandria moves first, what is the subgame perfect Nash equilibrium?

A)　Top, Left　　　B) Bottom. Right　　　C)Bottom, Left　　　D) Top, Right

19.12. A secure strategy is one with the _____ _____ payoff.

A) highest dominant
B) lowest maximum
C) highest minimum
D) minimum iterated

19.13. Finding a solution to a game using iterated dominance means
A) relying on strategies that will be dominant in each iteration of play.
B) iterating play between only dominant strategies.
C) first looking for strongly dominant strategies, and, only proceeding to search for weakly dominant ones if there are not strongly dominant strategies.
D) eliminating strategies that are dominated, taking the remaining ones as a new game, and repeating, until a solution is found.

Questions 19.14 and 15

Liam and Rebecca play the game depicted to the right, in which they may choose to compete *Hard*, *Medium*, or, *Soft*.

19.14. How many pure strategy equilibria does this game have?

A) 2   B) 0   C) 3   D) 1

Questions 18-20		Liam		
		Hard	Medium	Soft
Rebecca	Hard	R: 3 / L: 2	R: 4 / L: 2	R: 5 / L: 0
	Medium	R: 3 / L: 3	R: 6 / L: 5	R: 14 / L: 2
	Soft	R: 1 / L: 4	R: 3 / L: 11	R: 10 / L: 8

19.15. In the most "reasonable" solution to this game, both players play _____.

A) mixed strategies   B) Soft   C) Hard   D) Medium

Questions 19.16 and 17

Britany and Eric are each trying to decide what to buy their boss for his birthday- basketball tickets or concert tickets. Britany has better connections and can get better tickets to either event. Neither of them likes their boss much, so each only cares about looking as impressive as possible relative to the other. If both give basketball tickets, Britany's payoff is 8 and Eric's is 3, because hers are better. If both give concert tickets, Britany's payoff is 9 and Eric's is 2, because hers are better. If Britany gives basketball tickets and Eric gives concert tickets, Britany's payoff is 5 and Eric's is 4. If Britany gives concert tickets and Eric gives basketball tickets, Britany's payoff is 6 and Eric's is 5.

19.16. Assume they play simultaneously. In the Nash equilibrium, what is the probability that Eric gives basketball tickets?

A) 0   B) 2/3   C) 1/3   D) 1

19.17. Now assume Britany goes first. What is Eric's equilibrium payoff?

A) 2   B) 4   C) 3   D) 5

22.1. Rebecca and Molly each have a paintball gun pointed at the other at pointblank range. If one fires and the other doesn't, the one that fires gets satisfaction of +100 and the other gets satisfaction of -100. If both fire, they both get satisfaction of -50. If neither fires, they both get satisfaction of 0. What is the pure strategy Nash equilibr(ium/a) in the one shot game?

A) Both Molly and Rebecca fire.
B) Neither Molly nor Rebecca fire.
C) Either Molly of Rebecca fire, but, not both.
D) There are no pure strategy equilibria.

22.2. Sam was offered a job where he must work with Ed. If Sam accepts the job and Ed works cooperatively with him, they each earn a payoff of 80. But, Ed does not like Sam and might refuse to cooperate. If Sam accepts the job and Ed does not cooperate, both Ed and Sam earn a payoff of 40. If Sam instead accepts another job offer, his payoff would be 50 and Ed would continue to work alone, making his payoff 100. What are the payoffs in the sub-game perfect Nash equilibrium of this game?

A) Sam: 50, Ed: 100   B)   Sam: 80, Ed: 80   C)   Sam: 40, Ed: 40
D) The equilibrium is in mixed strategies

Questions 33-35
David and Laura are expanding into an emerging market. If both are aggressive, expected profits are 80 each. If both are accommodating, expected profits are 200 each. If one is aggressive and the other is accommodating, the aggressive one makes 260 and the accommodating one makes 120.

25.33. What payoff does David receive if both players play their secure strategies?
A) 80   B) 120   C) 200   D) 260

25.34. If play is simultaneous, how many pure strategy Nash Equilibrium does the one shot version of this game have?
A) 0   B) 1   C) 2   D) 3

25.35. If play is sequential with David Moving first, what payoff does he receive in the sub game perfect Nash Equilibrium?
A) 80   B) 120   C) 200   D) 260

CHAPTER 14 - REPEATED GAMES

TRUE FALSE

20.7.   Cooperation in repeated games is more likely when there is more noise, since careful coordination becomes crucial.

24.4. A focal point occurs whenever one equilibrium involves less uncertainty than another.

24.5. When a game has multiple Nash equilibria, all are equally reasonable ways to play.

24.6. A reputation that costs less to acquire is less likely to affect the behavior of other players.

24.7. The value of a reputation grows over time as the player holding it approaches retirement.

24.8. "Sane" players always want to differentiate themselves from "crazy" players by their actions.

25.36. Reputations are more valuable to a player when they are nearing retirement than early in their careers.
A) True   B) False

25.37. Increasing the number of players in a cartel makes cooperation easier to motivate and enforce.
A) True   B) False

25.38. Forgiveness in tit for tat type strategies is necessitated by the presence of noise in the perception of the choices of one's opponents.
A) True   B) False

MULTIPLE CHOICE

3.50.   Kelly and Mike repeatedly play a game in which both receive a payoff of $0 in the one shot Nash equilibrium. If they cooperate, each earns a payoff of $100. If the discount rate (r) is .1 and the probability that their products become obsolete after any given period (f) is .15, what is the highest payoff either could receive from "cheating" against the other's trigger strategy for which "cooperation" may be sustained? It may be helpful to note that

$$\sum_{t=0}^{\infty}\left(\frac{1-f}{1+r}\right)^t = \frac{1+r}{r+f} \text{ and } \sum_{t=1}^{\infty}\left(\frac{1-f}{1+r}\right)^t = \frac{1-f}{r+f}.$$

A) $400   B) $440   C) $5250   D) $1,000   E) $1,110

Questions 11 & 12
Ross and Sam are the only two producers of gadgets. Both have many loyal customers, but, some customers would switch if the other firm's price was low enough. If Ross aggressively goes after the price conscious customers and Sam does not, Ross makes $30 and Sam makes $0. If Sam aggressively pursues the price conscious customers, Sam makes $30 and Ross makes $0. If both aggressively pursue the price conscious customers, both make $10. If neither is aggressive, both make $20.

1.11.   What is the pure strategy Nash equilibrium of this game if it is played only once?
A) Ross Aggressive; Sam Not Aggressive
B) Ross Aggressive, Sam Aggressive
C) Ross Not Aggressive; Sam Aggressive
D) Ross Not Aggressive; Sam Not Aggressive
E) none of the above

1.12.   If the discount rate is .1, what is the highest probability of widgets becoming obsolete for which it is possible for Sam and Ross to raise their profits through "cooperation" via grim trigger strategies?
A) .45   B) .55   C) .33   D) .5   E) none of the above

Questions 21 & 22
Mike and David are the only two producers of gadgets. Both have many loyal customers, but, some customers would switch if the other firm's price was low enough. If Mike aggressively goes after the price conscious customers and David does not, Mike makes $35 and David makes $2. If David aggressively pursues the price conscious customers and Mike does not, David makes $35 and Mike makes $5. If both aggressively pursue the price conscious customers, both make $8. If neither is aggressive, both make $20.

4.21.   What is the pure strategy Nash equilibrium of this game if it is played only once?
A) Mike Aggressive; David Not Aggressive
B) Mike Aggressive, David Aggressive
C) Mike Not Aggressive; David Aggressive
D) Mike Not Aggressive; David Not Aggressive

4.22.   Suppose the discount rate is 0.1 and the probability of gadgets becoming obsolete after any given period is 0.175. What is the highest Nash Equilibrium payoff for which it is possible for David and Mike to raise their profits through "cooperation" via grim trigger strategies, assuming all other payoffs stay the same as given? It may be helpful to note that

$$\sum_{t=0}^{\infty}\left(\frac{1-f}{1+r}\right)^t = \frac{1+r}{r+f} \text{ and } \sum_{t=1}^{\infty}\left(\frac{1-f}{1+r}\right)^t = \frac{1-f}{r+f}.$$

A) 5   B) 10   C) 15   D) 20

7.12.   Suppose an incumbent firm will play a pricing game against a different potential entrant many times. If the potential entrant enters and the incumbent accommodates them, both firms make $10. If the incumbent fights the entrant for the market, both lose $5. If the entrant stays out, the incumbent makes $20. Everyone knows that there is some small number of incumbents who will always fight any entrant. How high must the present value of a reputation as a tough incumbent be to induce an economically rational incumbent to fight an entrant?

a) 5   b) 10   c) 15   d) 20

8.4.   A reputation that is very easy to acquire
A) is more valuable, since less is lost in acquiring it.
B) is less valuable, since the holder always has an incentive to keep it in tact.
C) is less valuable, since no one will believe the holder will make sacrifices to keep it.
D) is more valuable, since everyone knows the holder will be willing to get it back if lost.

8.5.   In a game repeated many times, outcomes based on threats or promises that are not credible in a one shot game are *EASIER* to sustain
A) the less likely it is that an "honest" player will be encountered.
B) the more likely it is that the game will end after any given period.
C) the higher the interest rate.
D) the easier it is to monitor other player's actions.

12.7.   Which of the following make it *harder* to sustain cooperation (and other play inconsistent with equilibria in one shot games) in the context of repeated games?
A) Lower interest rates
B) More "crazy" players
C) A higher probability of the game ending
D) Less noise in monitoring opponent's play

11.12. In a game repeated many times, outcomes based on threats or promises that are not credible in a one shot game are *EASIER* to sustain the
A) less likely it is that the game will end after any given period.
B) less likely it is that an "honest" player will be encountered.
C) more players are involved.
D)   higher the interest rate.

7.10.   Chelsea and Andrew run the only two firms that sell Widgets in Medium City. If they both compete aggressively, they both break even. If neither competes aggressively, they both make $20. If one competes aggressively and the other does not, the aggressive one makes $40 and the other makes -$10 (a loss of $10). The game will be played again and again with no definite end period. The probability that widgets will become obsolete after any period is 0.3. What is the highest interest rate at which implicit cooperation via grim trigger strategies is possible?

a) 0.1   b) 0.2   c) 0.3   d) 0.4

14.6.   A reputation that was hard to acquire
A) is less valuable, since it resulted in a larger sunk cost.
B) is less valuable, since the holder will not take risks with it.
C) is more valuable, since it reduces risk taking.
D) is more valuable, since the holder will sacrifice to keep it.

14.5.   Suppose an incumbent firm will play a pricing game against a different potential entrant
    many times. If the potential entrant enters and the incumbent accommodates them, both
    firms make $5. If the incumbent fights the entrant for the market, both lose $5. If the entrant
    stays out, the incumbent makes $10. Everyone knows that there is some small number of
    incumbents who will always fight any entrant. How high must the present value of a
    reputation as a tough incumbent be to induce an economically rational incumbent to fight an
    entrant?
A) 10   B) 5   C) 20   D) 30

Questions 9 and 10
    Mike and David are the only two producers of gadgets. Both have many loyal customers, but,
    some customers would switch if the other firm's price was low enough. If Mike aggressively
    goes after the price conscious customers and David does not, Mike makes $30 and David
    makes $5. If David aggressively pursues the price conscious customers and Mike does not,
    David makes $30 and Mike makes $5. If both aggressively pursue the price conscious
    customers, both make $10. If neither is aggressive, both make $20.

14.9.   What is the pure strategy Nash equilibrium of this game if it is played only once?

A) Mike Aggressive; David Not Aggressive
B) Mike Aggressive, David Aggressive
C) Mike Not Aggressive; David Aggressive
D) Mike Not Aggressive; David Not Aggressive

14.10. Suppose the discount rate is 0.1 and the probability of gadgets becoming obsolete after
    any given period is 0.4. What is the highest payoff for being aggressive when the opponent is
    not for which it is possible for David and Mike to raise their profits via grim trigger
    strategies, assuming all other payoffs stay the same as given?

A) 15   B) 20   C) 28   D) 32

15.3.   In a repeated prisoner's dilemma played exactly 10 times, cooperation is a Nash
    equilibrium in
A) all but the last period.
B) early periods, but will end some time before the last period.
C) none of the periods.
D) more periods when the discount rate is smaller.

15.4.　A number of identical firms play a repeated competitive game. The interest rate is 0.2 and the probability their product becomes obsolete and the game ends is 0.2. If they all set monopoly prices, each makes an equal share of an aggregate industry profit of $1000. If one individual firm defects (cheats) while all others cooperate and charge monopoly prices, that firm makes $500. In the Nash equilibrium of the one shot game, price competition is fierce, reducing industry profit to $100, of which all firms earn an equal share. What is the largest number of firms for which cooperation is possible as a Nash equilibrium in the repeated game?

A)　3　　　　　　　　B) 9　　　　　　　　C) 7　　　　　　　　D) 5

15.5.　Which of the following makes cooperative behavior harder to achieve in repeated games?
A)　Increased noise
B)　Demand growth
C)　Less chance of product obsolescence
D)　Fewer players

Questions 18-20. Joe and Haley play the game depicted to the right, in which they may choose to compete *Hard*, *Medium*, or, *Soft*.

Questions 17-20		Joe		
		Hard	Medium	Soft
Haley	Hard	H: 0.0 J: 0.0	H: 0.0 J: 0.5	H: 0.0 J: 0.0
	Medium	H: 0.5 J: 0.0	H: 1.5 J: 1.5	H: 2.5 J: 0.0
	Soft	H: 0.0 J: 0.0	H: 0.0 J: 2.5	H: 2.0 J: 2.0

15.18.　Assuming there are no *crazy* players (in the sense used in class) and that the game is played only once, which of the following is true?
A)　The players play iteratively dominant strategies.
B)　The players play *Medium*.
C)　The players play *Hard*.
D)　There are either 0 or 2 pure strategy equilibria.

Questions 19-20. Suppose Haley and Joe play this game 2 times and there is a chance, f, that any given player is *crazy*. A crazy player plays *Soft* in the first round. They then play *Soft* in the second round if their opponent played *Soft* in the first round. If their opponent did not play *Soft* in the first round, they play *Hard* in the second round. For simplicity, assume the interest rate, r, is 0.

15.19.　Suppose Haley is *sane* and she thinks that even if Joe is *sane* he will play *Soft* in the first round and play a/the one shot Nash equilibrium in the second round. What is the value of the reputation Haley gains as a cooperator if she also plays *Soft* in the first round (planning to play a/the one shot Nash equilibrium strategy in the second round)?
A)　$2.5f + 1.5(1 - f)$
B)　$2.5f$
C)　$2.5f + 1.5$
D)　$f + 1.5(1 - f)$

15.20. For what values of f is it a Nash equilibrium in the repeated game for sane players to play *Soft* in round 1?

A) $f \geq 1/4$ B) $f \geq 1/2$ C) $f \geq 1/3$ D) $f \geq 1/5$

18.22. A reputation that is very easy to acquire
A) is more valuable, since less is lost in acquiring it.
B) is less valuable, since the holder always has an incentive to keep it in tact.
C) is less valuable, since no one will believe the holder will make sacrifices to keep it.
D) is more valuable, since everyone knows the holder will be willing to get it back if lost.

22.3. Which of the following makes cooperative behavior harder to achieve in repeated games?
A) Increased noise
B) Demand growth
C) Less chance of product obsolescence
D) Fewer players

6.46.   Don and Mike are attempting to cooperate in a market with price competition using grim trigger strategies. The profit they earn while cooperating is $400. If one of the players were to cheat, he would receive a higher one time profit, but would only make $100 every year thereafter. If the discount rate is 0.1 and the probability of the game ending after each period is 0.3, what value of the one time profit from cheating would make Don and Mike indifferent about cheating or cooperating? (Choose the interval containing the correct answer.)
A) $0 to $399.99   B) $400 to $799.99   C) $800 to $1,199.99   D) $1,200 or over

Chapter 15. HOMOGENOUS PRODUCT MARKETS – MONOPOLY AND OLIGOPOLY

TRUE FALSE

4.8.   In quantity competition, reactions functions slope up because, if your competitor increases production, you have to increase production just to keep up.

4.9.   Two firms with identical constant per unit costs and no capacity constraints produce identical products in the same market and engage in price competition in a one shot game. Since there is competition, price will be significantly below the monopoly level in the Nash equilibrium.

4.10.   Two firms with identical constant per unit costs and no capacity constraints produce identical products in the same market and engage in price competition in a one shot game. Since there are only two competitors, price will be significantly above unit cost in the Nash equilibrium.

4.14.   Consider a pure monopolist and a firm in a homogenous product industry consisting of 10 firms, each charging a profit maximizing price of $10. At that price, the revenue brought in to the monopolist from the last unit sold is higher than the revenue brought in to an individual firm in the 10 firm industry by the last unit sold because the monopolist does not face competition.

20.5.   In quantity competition the strategic effect of cost reduction reinforces the direct effect.

24.9. In quantity competition, moving second is worse than moving simultaneously. **Topic 8**

24.12. If a simultaneous game has a unique pure strategy Nash Equilibrium, the first mover is always better off than the second mover in the sequential version of the game **Topic 8**

24.13. If a monopolist and a perfectly competitive firm each face a current price of $4, marginal revenue is higher for the monopoly. **Topic 8**

25.42. Robert and Michelle are two oligopolists engaged in quantity competition. Suppose Robert's marginal cost decreases. Then Robert's reaction function shifts out and Michelle's Nash equilibrium quantity increases.
A) True   B) False

25.43. In the long run, firms enter the market until marginal revenue is approximately equal to average cost for the marginal firm in a homogenous product oligopoly.
A) True   B) False

Questions 20.1 & 2
Luke and Sam are the only two firms in a homogenous product market. They face the same constant marginal cost and behave non cooperatively.

20.1.   If capacities are unlimited and prices are set simultaneously, profits are essentially zero.

20.2.   If they compete in quantity and Luke moves first, his profit will go up relative to the simultaneous move game, but Sam's will go up more.

20.3.   According to the Coase conjecture, durable goods monopolists are very profitable because they extract the present value of all future use of their product at the time of sale.

MULTIPLE CHOICE

1.16.   Two firms with identical constant per unit costs produce identical products in the same market. If they engage in price competition in a one shot game, which of the following is true of the pure strategy Nash equilibrium price?
A) It equals marginal cost.
B) There is no pure strategy Nash equilibrium.
C) It is a markup over marginal cost that depends on market demand elasticity.
D) It is a markup over marginal cost that depends on market demand elasticity divided by the number of firms.
E) none of the above

8.10   If two firms produce identical products at constant marginal and unlimited capacity engage in simultaneous move price competition, in the Nash equilibrium,
A) only mixed strategies are played.
B) price is approximately equal to unit cost.
C) price is between unit cost and the monopoly price.
D) price equals per unit cost times a mark up factor that depends only on the elasticity of market demand.

8.11.   If two firms produce identical products at constant marginal cost (for both operation and capacity) play a two stage game in which they first stage choose capacity then engage in simultaneous move price competition, in the Nash equilibrium
A) only mixed strategies are played.
B) price is approximately equal to unit cost.
C) price is between unit cost and the monopoly price.
D) price equals per unit cost times a mark up factor that depends only on the elasticity of market demand.

Questions 17-19.
Jennifer and Lindsay are the only two producers of widgets – a completely homogenous product. The firms first choose their quantities in one period, and then all output is sold in an open market at whatever price clears the market the next period. The inverse demand for widgets is given by $p = 10 - .1Q$, Lindsay's cost is $.15q_L^2$, and Jennifer's cost is $.3q_J^2$.

1.17.   What is Lindsay's profit function?
A) $(10 - .1q_L)(q_L + q_J) - .15q_L^2$
B) $(10 - .1(q_L + q_J))q_L - .3q_L$
C) $(10 - .1q_L)(q_L + q_J) - .3q_L$
D) $(10 - .1(q_L + q_J))q_L - .15q_L^2$
E) none of the above

1.18.   What is Lindsay's reaction function?
A) $10 - .1q_J$
B) $20 - .2q_J$
C) $40 - .4q_J$
D) $10 - .2q_J^2$
E) none of the above

1.19.   If Jennifer invests in an advertising campaign that increases the demand for widgets, which of the following will occur.
A) Jennifer's output decreases and Lindsay's increases
B) Jennifer's output increases and Lindsay's output decreases.
C) Jennifer's output decreases and Lindsay's output decreases.
D) Jennifer's output increases and Lindsay's output increases.
E) none of the above

6.26.   Imagine two otherwise identical retail outlets on opposite ends of a town. Customers are uniformly distributed between the two outlets, and incur a constant transport cost per unit distance. Both firms have the same constant marginal cost of production. Which of the following is NOT true?
A) if the transport cost per unit distance is very high, prices will equal the monopoly level.
B) if the transport cost per unit distance is 0 and capacity is unlimited, price will equal marginal cost.
C) if the transport cost per unit distance is 0 and each firm's capacity is less than half the total market, price will equal marginal cost.
D) if transport cost per unit distance is 0, if the firms must choose capacity in a first stage of the game prior to setting prices, and if the cost of capacity is constant per unit of capacity put in place, equilibrium price will be between cost and the monopoly level.

Questions 25 & 26
The least efficient firm in a homogenous product industry has cost given by 15+2q. The other firms produce 200 units in total. Demand in the market is given by $Q = 220 - 2p$.

4.25.   What is the least efficient firm's profit function?
A) $(10 - .5q)q - 2q - 15$
B) $(10 - .5q)(q - 2) - 15$
C) $(20 - 2Q)q - 2q - 15$
D) $(20 - 2Q)(q - 2) - 15$

4.26.   In the long run, if there are no entry barriers, which of the following will occur?
A) Total industry output will increase
B) Total industry output will decrease
C) Firms will specialize further since the products are homogenous
D) Firms will merge because the products are homogenous

Questions 53-55.
Hannah and Lindsay are the only two producers of widgets – a completely homogenous product. The inverse demand for widgets is given by $p = 10 - .05Q$. Hannah's reaction function is $q_H = 60 - .5q_L$. Lindsay's constant marginal cost is \$2. Lindsay chooses her quantity first (she is the Stackelberg leader).

3.53.   What is Lindsay's profit function?
A) $(10 - .1q_L - .1(60 - .5q_L))q_L - 2q_L$
B) $(10 - .05(60 - .5q_L))q_L - 2q_L$
C) $(10 - .05q_L - .025q_H)q_L - 2q_L$
D) $(10 - .05q_L - .05(60 - .5q_L))q_L - 2q_L$

3.54.   What quantity does Lindsay choose to maximize profit?
A) 50   B) 100   C) 140   D) 160   E) 200

3.55.   Compared to the case when the firms move simultaneously, which of the following is true?
A) Lindsay produces more and Hannah responds by producing less.
B) Lindsay produces less and Hannah responds by producing less.
C) Lindsay produces more and Hannah responds by producing more.
D) Lindsay produces less and Hannah responds by producing more.

Questions 27-28

Lindsay and Marianna are the only two producers of widgets – a completely homogenous product – and engage in quantity competition. The inverse demand for widgets is given by $p = 10 - .25Q$, Marianna's reaction function is given by $10 - .25q_L$ Lindsay's cost is $.125q_L^2$. Lindsay moves first.

4.27.   What is Lindsay's profit function?
A) $(10 - .25q_L)(10 - .25q_L + q_L) - .25q_L$
B) $(10 - .25(10 - .25q_L + q_L))q_L - .25q_L$
C) $(10 - .25(10 - .25q_L + q_L))q_L - .125q_L^2$
D) $(10 - .25q_L)(10 - .25q_L + q_L) - .125q_L^2$

4.28.   What quantity maximizes Lindsay's profit?
A) 10   B) 12   C) 15   D) 18

6.27.   Look at the figure below pertaining to homogenous product quantity competition, and, then choose the caption from the available choices that best fits.
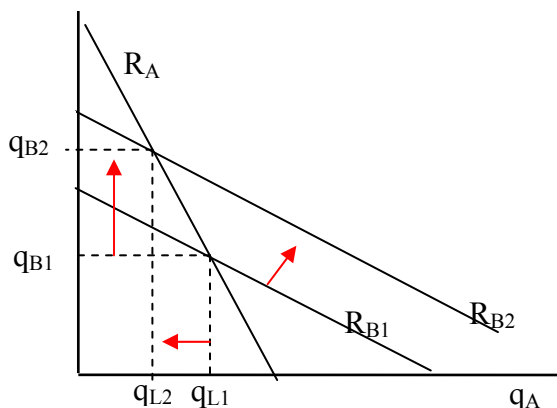
A) Effect of a decrease in firm B's marginal cost.
B) Effect of an increase in firm B's advertising budget.
C) Effect of a decrease in firm A's advertising budget.
D) Effect of an increase in firm A's marginal cost.

7.21.   If two firms selling identical products engage in sequential move quantity competition, relative to simultaneous move competition, which of the following is true?
a) The second mover is better off, because they can see what the first mover does and fully exploit that information.
b) The first mover is better off, as all flexibility in output choice is lost before the second firm chooses its output, and, that flexibility would reduce profit.
c) In quantity competition, profits for the sequential and simultaneous move games are identical.
d) The first mover is better off due to the loss of output flexibility if MR>MC, worse of if MR<MC, and, it does not matter if MR=MC.

7.47. Look at the figure below and then choose the caption from the available choices that best fits the picture.

R_A

q_{B2}

q_{B1}

R_{B1} R_{B2}

q_{L2} q_{L1} q_A
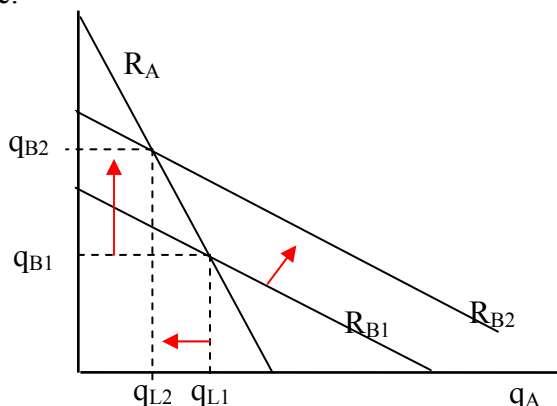
a)   A decrease in firm B's marginal cost in homogenous product quantity competition.
b)   A decrease in firm B's advertising budget in homogenous product quantity competition.
c)   An increase in firm B's advertising budget in differentiated product price competition.
d)   An increase in firm B's marginal cost in differentiated product price competition.

8.12.   When two firms engage in quantity competition in a homogenous product market,
A)   there is a second mover advantage, because the second mover gets to see their opponent's choice and react accordingly.
B)   advertising is more important than in a monopoly, since the firm can take market share from opponents.
C)   the direct effect of a cost reduction available to only one firm increases that firm's profit, but the indirect effect counteracts that to a degree by stiffening competition between the rivals.
D)   the direct effect of a cost reduction available to only one firm increases that firm's profit, the indirect effect further increases profit by lowering the opponents output.

11.32. There are 28 firms in a homogenous product industry engaging in simultaneous quantity competition. Inverse demand is given by $p(Q) = 120 - 0.5Q$. In the Nash equilibrium, firms 1 thru 27 produce 8 units each, or, 216 total. The 28th firm's cost function is given by $C(q) = 50 + q^2$. How much does the 28th firm produce?

A) 8   B) 2   C) 4   D) 6

11.14. If two firms which produce identical products at constant marginal cost (for both operation and capacity) play a two stage game in which they first stage choose capacity then engage in simultaneous move price competition, in the Nash equilibrium
A) price is between unit cost and the monopoly price.
B) price equals the midpoint between per unit cost and the intercept of the inverse demand curve.
C) price is approximately equal to unit cost.
D) only mixed strategies are played.

13.5. Under price competition, the strategic effect of a cost reduction _____ the direct effect, while under quantity competition, it _____ the direct effect. (Assuming the cost reduction is not large enough to force any competitors from the market.)
A) reinforces : reinforces   B) counters : reinforces
C) reinforces : counters   D) counters : counters

Questions 8 & 9
Mari and Lindsay are the only 2 providers of gadgets, a homogenous product, and, engage in quantity competition. The inverse demand is $p(Q) = 13 - 0.2Q$, and, the constant per unit cost is $3 for both firms.

13.8. What is Mari's reaction function?
A) $R_M(q_L) = 20 - 0.4q_L$ B) $R_M(q_L) = 10 - 0.6q_L$
C) $R_M(q_L) = 25 - 0.4q_L$ D) $R_M(q_L) = 25 - 0.5q_L$

13.9. What is the Nash equilibrium price?
A) 5   B) 6.33   C) 6.67   D) 10

Questions 2 & 3
Consider the model from class in which two otherwise identical products were sold by competing firms at either end of a street with customers uniformly distributed between locations. Firms have no capacity limits and identical constant per unit costs. Everyone buys from one provider or the other.

13.2. In this model, the transportation costs parameter represents
A) the portion of variable cost due to delivering final products to retail outlets.
B) the geometric decay rate of the maximum surplus.
C) value added by the transportation sector in equilibrium.
D) value lost if product characteristics do not match a consumer's ideal.

13.3. If the transport cost is 0, the Nash equilibrium price is
A) between per unit cost and the monopoly price.   B) approximately 0.
C) approximately equal to per unit cost.   D) equal to the midpoint between value and cost.

14.12. If two firms selling identical products engage in sequential move quantity competition, relative to simultaneous move competition, which of the following is true?
A) The second mover is better off, because they can see what the first mover does and fully exploit that information.
B) In quantity competition, profits for sequential and simultaneous move games are identical.
C) The first mover is better off due to the loss of output flexibility if MR>MC, worse of if MR<MC, and, it does not matter if MR=MC.
D) The first mover is better off because all flexibility in output choice is lost before the second firm chooses its output.

14.13. Look at the figure below and then choose the caption from the available choices that best fits the picture.
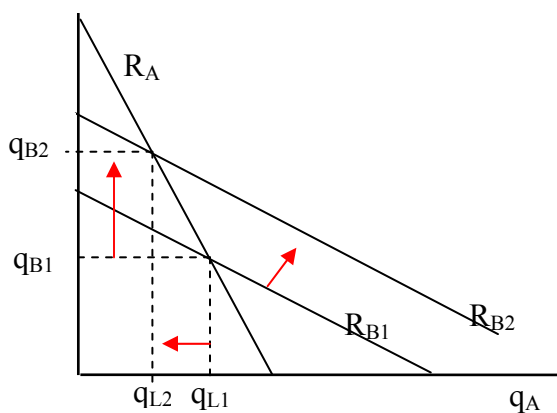
A) A decrease in firm B's marginal cost in quantity competition.
B) A decrease in firm B's advertising budget in quantity competition.
C) An increase in firm B's advertising budget in price competition.
D) An increase in firm B's marginal cost in price competition.

15.15. With perfectly homogenous products, the incentive for advertising is
A) high, because advertising increases ones market share.
B) low, because all firms benefit from advertising but only one incurs the costs
C) low, because advertising does not affect overall demand for homogenous products
D) high, because advertising increases overall demand for homogeneous products

15.16. Caroline and David, the only providers of a completely homogenous product, play a one shot simultaneous pricing game. They each could produce enough to meet market demand and face the same constant marginal cost. Which of the following is true of the Nash equilibrium?
A) The price is halfway between the monopoly price and marginal cost.
B) The price mark up over marginal cost depends only on the market demand elasticity.
C) Price is essentially equal to the perfectly competitive price
D) Price is somewhere between the monopoly price and the perfectly competitive price

Questions 20.17 & 18

Kevin and Michael engage in repeated quantity competition. If they each produce half the monopoly output, they make $9 each per period. If they engage in Cournot competition, they each make $6. If one maximizes profit while the other restricts output to half the monopoly level, the one maximizing profit makes $12 and the one producing half the monopoly output makes $4. The probability the game will end after any play is 0.2 and the interest rate is 0.05.

Assume Michael plays as follows. 1) He produces half the monopoly output the first period and continues to do so as long as Kevin has produced half the monopoly output every period in the past. 2) If Kevin ever does otherwise, Michael reverts reverts to Cournot competition thereafter.

20.17. What is the expected present value of Kevin's profit if he adopts Michael's strategy?
A) 19.2   B) 31.2   C) 37.8   D) 28.8

20.18. What is the expected present value of Kevin's payoff if he maximizes profit at time 0 while Michel produces half the monopoly output and engages in Cournot competition thereafter?
A) 19.2   B) 31.2   C) 37.8   D) 28.8

Questions 22.14-15

Bill currently manages the highest cost firm of 5 firms in a homogenous product market. His firm's cost function is $C(q) = 150 + \dfrac{q^2}{50}$. In the Nash equilibrium, the other 4 firms produce 120 units total. Let $\bar{Q}_4$ represent total output of the other 4 firms. Market inverse demand is

$$p = 6 - \frac{Q}{100}$$

22.14. Bill's reaction function is $q = 100 - \dfrac{\bar{Q}_4}{6}$.

A) True   B) False

22.15. In the long run, firms exit this industry.
A) True   B) False

22.16. With perfectly homogenous products, the incentive for firm level advertising is
A) high, because advertising increases ones market share.
B) low, because all firms benefit from advertising but only one incurs the costs
C) low, because advertising does not affect overall demand for homogenous products
D) high, because advertising increases overall demand for homogeneous products

Chapter 16. DIFFERENTIATED PRODUCT MARKETS

TRUE FALSE

3.19. Jake produces differentiated gadgets and engages in price competition against a few other firms in a simultaneous move game. Therefore, he gains more from reductions in his marginal cost than would a monopolist facing the same initial demand curve, because he can take sales away from competitors.

3.20. Charles produces differentiated gadgets and engages in price competition against a few other firms in a simultaneous move game. Therefore, he gains less from reductions in his marginal cost than would a monopolist facing the same initial demand curve, because his competitors strategically reduce price in response.

3.21. In markets in which there are no entry barriers and a large number of small firms sell similar but differentiated products, a typical firm just breaks even in the long run.

3.22. In markets in which there are no entry barriers and a large number of small firms sell similar but differentiated products, advertising by an individual firm benefits all firms.

5.6.   Jessica produces differentiated gadgets and engages in price competition against a few other firms in a simultaneous move game. Therefore, she gains less from reductions in marginal cost than would a monopolist facing the same initial demand curve, because of the response of her competitors.

5.7. In markets in which there are no entry barriers and a large number of small firms sell similar but differentiated products, a typical makes profits in the long run due to the local (n product space) monopoly power created by differentiation.

6.10. Ace and Base produce products that exhibit small differences and engage in price competition. It is in both firms interest to not set prices simultaneously. However, if Ace sets their price first, they make a larger profit than if Base sets their price first.

20.4.   In differentiated product price competition, the strategic effect of firm level advertising reinforces the direct effect if demand for the competitor's product does not change much.

20.6.   Many firms each produce a slightly differentiated product in long run equilibrium. If fixed costs go up, product variety will go up in the long run to defray the fixed costs.

20.12. Firms in differentiated product markets may quite rationally introduce new varieties that reduce profits from their original product by more than profits generated by the new ones.

24.10. In differentiated product price competition, it is better to move second than simultaneously. Topic 9

Questions 24.18-24.19
A firm faces a constant demand elasticity of -6 and a constant marginal cost of $10. A study of their advertising expenditures indicates that, at the margin, another $1,000 spent on advertising increases sales by 400 units.

24.18. The firm's profit maximizing price is 14.

24.19. The firm should advertise less.

MULTIPLE CHOICE

Questions 1 and 2
Susana and Tina are the only producers of uWidgets and produce slightly different versions. The demand for Tina's product is given by $q_T = 100 - 5(p_T - p_S)$ and her constant unit cost is $5. Susana's reaction function is given by $p_S = 10 + 0.25 p_T$.

9.1.   What is Tina's reaction function if both players choose their prices **simultaneously**?
A) $p_T = 12.5 + 0.5 p_S$ B) $p_T = 10 + 0.25 p_S$
C) $p_T = 12.5 + 0.25 p_S$ D) $p_T = 10 + p_S$

9.2.   What is Tina's profit function if the game is **sequential** and she moves **first**?
A) $(100 - 5p_T + 5(10 + 0.25 p_T))5(p_T - p_S)$
B) $(100 - 5p_T + 5(10 + 0.25 p_T))(p_T - 5)$
C) $(100 - 5p_T + 5(10 + 0.25 p_T) - 5)(p_T - 5)$
D) $(200 - 10p_T + 5(10 + 0.25 p_T) - 5)p_T$

13.4.   In price competition games with a first mover, compared to their price in the simultaneous move game, the first mover's price is
A) lower to secure a larger market share.
B) lower to minimize exposure to predatory pricing.
C) higher to induce the second mover to also charge a higher price.
D) higher to skim profits from early adopters.

13.7.   Compared to the case where products are differentiated, if products are known by everyone to be perfectly homogenous, firm level advertising becomes
A) less important, because benefits spill over to all firms regardless of which funded the advertising.
B) more important, since there is no other way to gain a competitive edge.
C) less important if the cross elasticity of advertising is larger than 1.
D) more important if the elasticity of demand is less than -1.

Questions 11-12. The price elasticity of demand for Nintendo Wiis (wholesale) is -1.5, marginal cost is constant at $50, current sales are 10,000 units, current advertising is $10,000, and, Nintendo currently charges the profit maximizing price. Nintendo estimates the advertising elasticity of demand is 0.01 (spending an additional 100% on advertising would boost sales by 1%).

16.11.   The current advertising level is _____ the profit maximizing level.
A) greater than   B) equal to
C) less than   D) increasing in q

16.12. Suppose Nintendo needs to increase units sold by 10% for long term reasons unrelated to short term profit. Would it reduce short term profits less to achieve the increase in sales by increasing advertising only or by reducing price only?
A) reducing price
B) increasing advertising
C) the two methods are equivalent
D) neither is feasible

1.20. Firm A and Firm B produce slightly differentiated products and engage in price competition. If Firm A invests in an advertising campaign that attracts new customers for its product at every price but does not affect the demand for Firm B's product, which of the following will occur?
A) Firm A's price increases, but Firm B's price stays the same.
B) Firm A's price increases, and the strategic effect increases Firm B's price as well.
C) Firm A's price increases, but the strategic effect lowers Firm B's price.
D) Firm A's price increases, but Firm B's price may increase, decrease, or remain the same.
E) none of the above

2.2. When a firm with market power makes zero economic profit, which of the following is true?
A)   It should exit the industry because it is not earning a fair return for its shareholders.
B)   It is doing as well for its shareholders as they expect from their best alternative investment.
C)   It is not setting price where marginal revenue is equal to marginal cost.
D)   It is not choosing the input combination that minimizes production cost.
E)   none of the above

2.3.   The marginal firm in a monopolistically competitive industry faces inverse demand $p = 11 - .1q$ and has a constant marginal cost of $3 and fixed costs of $180. Which of the following is correct?
A)   Firms will enter this industry.
B)   Firms will exit this industry.
C)   Since products are differentiated, product variety must increase.
D)   Since products are differentiated, we don't know if firms will enter or exit.
E)   none of the above

2.5. Consider a firm producing in a differentiated product industry with a constant marginal cost of $15, facing a demand curve with a constant elasticity, and charging an optimal price of $20. If another $1 spent on advertising leads to .25 additional units sold, which of the following is correct?
A) The firm should decrease advertising expenditures.
B) The firm should increase advertising expenditures.
C) The firm should decrease price and advertising expenditures in proportion to relative elasticities.
D) The firm should increase price and advertising expenditures in proportion to relative elasticities.
E) none of the above

5.11. The marginal firm in a monopolistically competitive industry faces inverse demand $p = 20 - 2q$ and has a constant marginal cost of $4 and fixed costs of $30. Which of the following is correct?
A) Product variety will increase.
B) Product variety will decrease.
C) The number of different products will remain the same unless something else changes.
D) The information given sheds no light on expected changes in product variety.

5.12. Consider a firm producing in a differentiated product industry with a constant marginal cost of $10, facing a demand curve with a constant elasticity of -3, and charging the optimal product price. If another $1 spent on advertising leads to .25 additional units sold, which of the following is correct?
A) The firm should decrease advertising expenditures.
B) The firm should increase advertising expenditures.
C) The firm should alter price and advertising expenditures in proportion to relative elasticities.
D) The firm should alter price and advertising expenditures in proportion to relative costs and elasticities.

6.18.   In a differentiated products industry with no barriers to entry, if firms' fixed costs increase, which of the following will occur in the long run?
A) Product variety will decline and demand faced by each firm will decline.
B) Product variety will decline and demand faced by each firm will increase.
C) Product variety will increase and demand faced by each firm will decline.
D) Product variety will increase and demand faced by each firm will increase.

6.28.   Look at the figure below pertaining to differentiated product price competition, and, then choose the caption from the available choices that best fits.
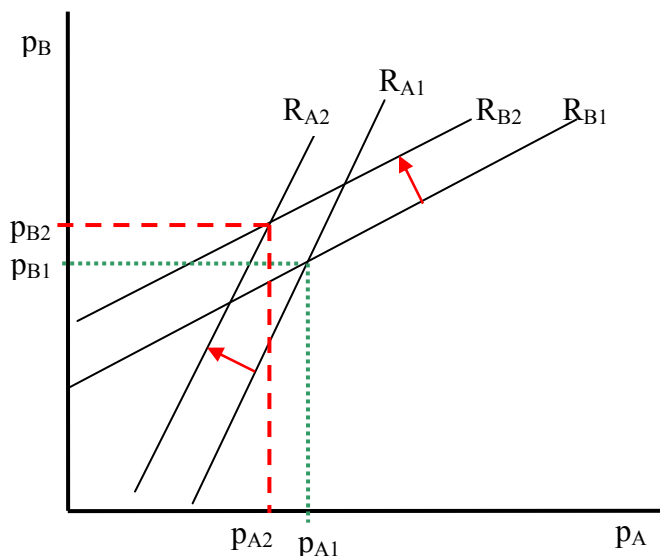
A) Effect of a decrease in firm B's marginal cost.
B) Effect of an increase in firm B's advertising budget.
C) Effect of an increase in firm A's advertising budget.
D) Effect of a decrease in firm A's marginal cost.

6.44.   Stephanie and Thomas are the only 2 producers of a differentiated product and engage in price competition. Thomas' reaction function is $p_T = 10 + .5p_S$. If Stephanie's demand function is given by $Q_S = 20 - p_S + .5p_T$, her constant per unit cost is $1, and she moves first, what price does she set? (Choose the interval containing the correct answer.)
A) $0 to $4.99
B) $5 to $9.99
C) $10 to $14.99
D) $15 or more

Questions 15-17.
Susana and Tina run the only 2 restaurants in Small Town. The fraction of Small Town's population that buys a meal at Susana's is $f_S = 0.2 - 0.025p_S + 0.02p_T$, where subscripts denote the restaurant. The fraction of Small Town's population that buys a meal at Tina's is $f_T = 0.2 - 0.025p_T + 0.02p_S$. The marginal cost at each restaurant is $4. Prices are set simultaneously. Let N represent the total population of Small Town.

7.15.   What is Susana's profit function?
a) $\pi_S = (0.2 - 0.025p_S + 0.02p_T)N - 4Np_S$
b) $\pi_S = N(0.2 - 0.025p_S + 0.02p_T)(f_S - 4)$
c) $\pi_S = (0.2 - 0.025p_S + 0.02p_T)N - 4Nf_S$
d) $\pi_S = N(0.2 - 0.025p_S + 0.02p_T)(p_S - 4)$

7.16.   What is the price charged by Tina in the Nash Equilibrium?
a) 6   b) 8   c) 10   d) 12

7.17.   If fixed costs are $900 for each restaurant, how high must population be for Susana to break even?
a) 100   b) 500   c) 750   d) 1000

14.15.   In a differentiated products industry with no barriers to entry in long run equilibrium, if firms' fixed costs increase, which of the following will occur?
A)   Product variety will decline and demand faced by each firm will decline.
B)   Product variety will decline and demand faced by each firm will increase.
C)   Product variety will increase and demand faced by each firm will decline.
D)   Product variety will increase and demand faced by each firm will increase.

Questions 13 and 14. Suppose the typical firm in a differentiated product industry faces demand given by $q = 3200 p^{-2}$, a constant marginal cost of $2, and a fixed cost of $300.

7.13.   What price maximizes profit?
a) 2   b) 4   c) 8   d) 16

7.14.   What happens in this market in the long run?
a) Product variety will increase.
b) Product variety will decrease.
c) The rate of research and development will converge.
d) The rate of research and development will diverge.

3.58.   Your firm just received the results of a study of the demand for your product. It reports that the demand for your firm's product can be closely approximated by $q = 100000 p^{-6} A^4$, where A is advertising expenditures. The cost of your product is $2. What is the price per unit of your product that maximizes profits?
A. $2.40   B. $2.50   C. $6.60   D. $10.00   E. $12.00

6.45.   Sally sells seashells by the seashore. Demand for the shells is given by $Q = 270 p^{-3} \ln(A)$ where A is expenditure on advertising. Sally's constant marginal cost is $2. What level of advertising maximizes profit?
A) $0 to $9.99   B) $10 to $19.99   C) $20 to $29.99   D) $30 or above

9.3. Consider a firm producing in a differentiated product market with a constant marginal cost of $12, facing a demand curve with a constant elasticity, and charging an optimal price of $15. If another $1 spent on advertising leads to .25 additional units sold, which of the following is correct?
A) The firm should decrease advertising expenditures.
B) The firm should increase advertising expenditures.
C) The firm should decrease price and advertising expenditures in proportion to relative elasticities.
D) The firm should increase price and advertising expenditures in proportion to relative elasticities.

9.4.   Suppose a typical firm in a differentiated product market has constant marginal cost of $4, fixed costs of $100, faces a constant elasticity of demand of -3, and, sells 60 units at the profit maximizing price. In the long run, the number of different products in this industry will
A) increase.   B) decrease.   C) stay the same.   D) this is a wrong answer.

11.15. When two firms engage in price competition in a differentiated product market
A) advertising is less beneficial to an individual firm because the products are already differentiated.
B) cost reductions have less strategic importance than if products were homogenous because differentiation insolates firms from the effects of competitor's price reductions.
C) cost reductions have more strategic importance than if products were homogenous because differentiation means only price reduction can cut into competitor's sales.
D) both firms would rather move first than second, to dictate the market price.

11.16. Consider a firm producing in a differentiated product market with a constant marginal cost of $4, facing a demand curve with a constant elasticity, and charging an optimal price of $8. If another $1 spent on advertising leads to 0.2 additional units sold, which of the following is correct?
A) The firm should decrease price and advertising expenditures in proportion to relative elasticities.
B) The firm should increase price and advertising expenditures in proportion to relative elasticities.
C) The firm should increase advertising expenditures.
D) The firm should decrease advertising expenditures.

13.10. The elasticity of demand for your firm's product is constant at -6 and the constant unit cost of production is $40. Your sales department reports that an additional $10 spent on advertising will increase sales by 1 unit. You should advertise
A) less.
B) more.
C) less if the elasticity of advertising is less than unity, more otherwise.
D) more if the elasticity of advertising is less than unity, more otherwise.

13.17. In long run equilibrium in homogenous or differentiated product industries in which there are no barriers to entry and in which there is room for several firms, _____ equals marginal cost and price _____ average cost.
A) price ; approximately equals
B) price ; is greater than
C) marginal revenue ; approximately equals
D) marginal revenue ; is greater than

15.14. Consider the model of differentiated products presented in lecture in which firms sold otherwise identical products at different locations. In that model, the equilibrium price was higher when the transportation cost parameter, t, increased. Why?
A) Firms' marginal costs increased.
B) Fewer firms had access to the market.
C) Non price characteristics are more important.
D) This is not the right answer.

15.17. In price competition with differentiated products there is
A) neither a first nor a second mover advantage.
B) a first mover advantage.
C) a second mover advantage.
D) a first mover advantage if there are economies of scale.

16.5.   Consider a monopolistically competitive industry in long run equilibrium. An increase in fixed costs will cause product variety in the market to _____ and the number of units sold by the typical firm in the industry to _____ relative to the initial equilibrium.
A) increase : increase   B)   increase : decrease
C) decrease : increase   D)   decrease : decrease

16.13. In price competition with differentiated products, a variable cost reduction is _____ profitable than in homogenous product quantity competition with the same initial residual demand curve.
A) not enough information   B)   more
C) less   D)   sometimes more and sometimes less

16.14. David manages an established firm that produces several slightly differentiated products in a market with several other firms. Last year, he introduced a new variety. As a result, while total revenues increased, sales of his other varieties declined, as did total profits. After that, the board of directors voted to give him a big raise. Which of the following is a likely explanation?
A) The board believes in social responsibility and the new variety was environmentally friendly.
B) David preempted entry that would have reduced profits even more.
C) David pushed the firm along the learning curve.
D) The board felt sorry for David

Questions 29-31

Alina is a monopolist. Brittaney is considering entering the market and producing a slightly differentiated product. Each would have plenty of capacity, so, they would engage in simultaneous price competition. If Brittaney entered, the demand for Alina's product would be $q_A = 14 - 0.5p_A + 0.25p_B$ and the inverse demand for Brittaney's product would be $q_B = 14 - 0.5p_B + 0.25p_A$. Both firms face a constant per unit cost of $2 and fixed costs of $10.

18.29. What is the equilibrium price in the simultaneous move pricing game?
A) 10 B) 15 C) 20 D) 25

18.30. Let $R_B(p_A)$ represent Brittaney's reaction function. If Alina moves first, which of the following would give her profit function?

A) $\pi_A = (14 - 0.5p_A + 0.25R_B(p_A))(p_A - 2) - 10$

B) $\pi_A = (14 - p_A + 0.25R_B(p_A))(p_A - 2) - 10$

C) $\pi_A = (11 - 0.5p_A + 0.25R_B(p_A))p_A - 10$

D) $\pi_A = (11 + 0.25R_B(p_A))p_A - 10$

18.31. If Alina moves first, which of the following is true relative to the simultaneous move game?
A) Alina's profit increases more than Brittaney's
B) Alina's profit increases and Brittaney's decreases
C) Alina's profit decreases and Brittaney's decreased
D) Alina's profit increases less than Brittaney's

18.32. Look at the figure at the right pertaining to differentiated product price competition, and choose the caption that best fits.

A) A decrease in firm B's marginal cost.
B) An increase in firm B's advertising budget.
C) An increase in firm A's advertising budget.
D) A decrease in firm A's marginal cost.
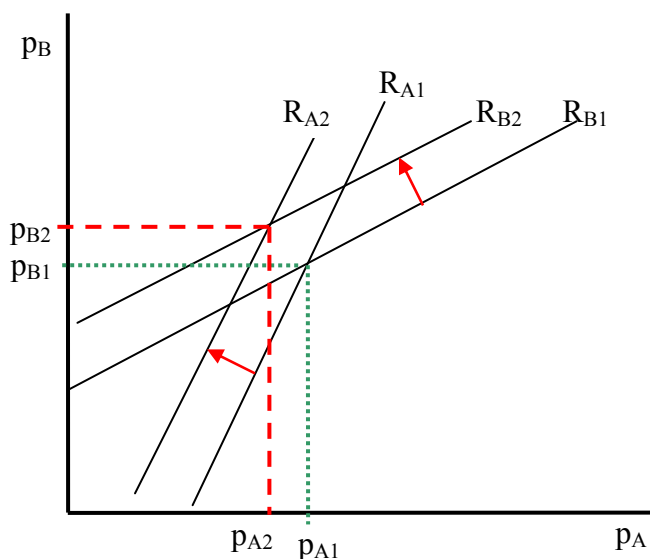
Questions 20.13-16

Tara and Brandon sell slightly differentiated products. Both must charge the manufacturer's suggested retail price, which is $2.5 for each. Both face a constant marginal cost of $1.5. Demand at Tara's outlet is $q_T = 11A_T - 5.5A_B - 0.5(A_T - 0.5A_B)^2$ where A_T is Tara's advertising and A_B is Brandon's. Demand at Brandon's outlet is $q_B = 11A_B - 5.5A_T - 0.5(A_B - 0.5A_T)^2$. Advertising levels are chosen simultaneously and non cooperatively.

20.13. Which of the following is Tara's profit function?
A) $\pi_T = (2.5 - 1.5 - A_T)(11A_T - 5.5A_B - 0.5(A_T - 0.5A_B)^2)$
B) $\pi_T = 11A_T - 5.5A_B - 0.5(A_T - 0.5A_B)^2 - A_T$
C) $\pi_T = 11A_T - 5.5A_B - 0.5(A_T - 0.5A_B)^2$
D) $\pi_T = (2.5 - 1.5 - A_T)(11A_T - 5.5A_B - 0.5(A_T - 0.5A_B)^2 - A_T)$

20.14. Which of the following is Tara's reaction function?
A) $A_T = 10 + A_B$
B) $A_T = 11 + 0.5A_B$
C) $A_T = 11 + A_B$
D) $A_T = 10 + 0.5A_B$

20.15. How much does Brandon advertise in the Nash equilibrium?
A) 20   B) 15   C) 10   D) 5

20.16. Now assume Brandon moves first. Compared to the simultaneous move game, Brandon advertises _____ and makes _____ profit. Hint: the reaction functions slope up.
A) more, less   B) more, more   C) less, less   D) less, more

22.13. David manages an established firm that produces several slightly differentiated products in a market with several other firms. Last year, he introduced a new variety. As a result, while total revenues increased, sales of his other varieties declined, as did total profits. After that, the board of directors voted to give him a big raise. Which of the following is a likely explanation?
A) The board believes in social responsibility and the new variety was environmentally friendly.
B) David preempted entry that would have reduced profits even more.
C) David pushed the firm along the learning curve.
D) The board felt sorry for David.

22.17. In price competition with differentiated products, a variable cost reduction is _____ profitable than in homogenous product quantity competition with the same initial residual demand curve.
A) not enough information
B) more
C) less
D) sometimes more and sometimes less

CHAPTER 17. PERFECT COMPETITION

True or False

24.11. With identical products, price competition, unlimited capacity, and constant marginal cost, Nash equilibrium profits fall as the number of competitors increases from two to three to four. **Topic 10**

6.11. Perfectly competitive firms can enhance profits by engaging in two part pricing, thus extracting some consumer surplus as profit.

Questions 24.20-24.22

Demand is $Q_D = 2750 - 1000p$. There are 50 price taking firms, each with total cost given by $C(q) = 10 + 0.5q + 0.05q^2$.

24.20. An individual firm's supply curve is $q = 10p - 5$.

24.21. The equilibrium price is $2.

24.22. In the long run, exit occurs

Questions 24.23-24.25

Demand is $Q_D = 1200 - 200p$. Supply is $Q_S = 200p$. Initially equilibrium price is 3 and quantity is 600. The government institutes a subsidy program whereby consumers are reimbursed for half the purchase price. That means the after subsidy price paid by consumers, p_D, is only half the price received by suppliers, p_S, so $p_D = 0.5p_S$.

23) The new equilibrium quantity is 800.

24) The amount of government expenditure on subsidy payments is 400.

25) The deadweight cost of the subsidy program is 200.

MULTIPLE CHOICE

Questions 5 and 6
Suppose the wholesale inverse demand for milk, a perfectly homogenous (and homogenized ☺) product is given by $p = 10 - .002Q$. Further, suppose that there are 100 small price taking firms in the industry, each with a cost function given by $C(q) = 10 + .025q^2$.

9.5.   Which of the following is the industry short run supply curve?
A) $p = 2.5Q$ B) $Q = 5p$ C) $Q = 2000p$ D) $p = .005Q$

9.6.   What is the short run equilibrium price?
A) 1   B) 2   C) 4   D) 10

13.16. Suppose there are 50 identical firms in a perfectly competitive industry, each with cost given by $C(q) = 15 + 0.5q + 0.05q^2$. The short run industry supply curve is
A) $Q_S = 25p - 5$
B) $Q_S = 10p - 5$
C) $Q_S = 500p - 125$
D) $Q_S = 500p - 250$

Questions 22.18-19 share common information.

22.18. Andi produces in a perfectly competitive industry. Her cost function is $C(q) = 10 + \dfrac{q^3}{300}$.
If price is \$16, how much should she produce to maximize profit?
A) 60   B) 20   C) 40   D) 0

22.19. If there are 50 firms and market demand is $Q_D = \dfrac{10000}{\sqrt{p}}$, equilibrium price is _____.

A) 20   B) 4   C) 5   B) 10

25.44. A perfectly competitive firm has a marginal cost of 0.25q. There are 20 firms in the market. Demand is Q_D=500-20p. What is the equilibrium price?
A) 2.5   B) 5   C) 7.5   D) 10

Questions 17-18

Refer to the figure below. The left panel of the figure depicts long run cost curves for a typical firm in a constant cost perfectly competitive industry. The right pane shows market demand.
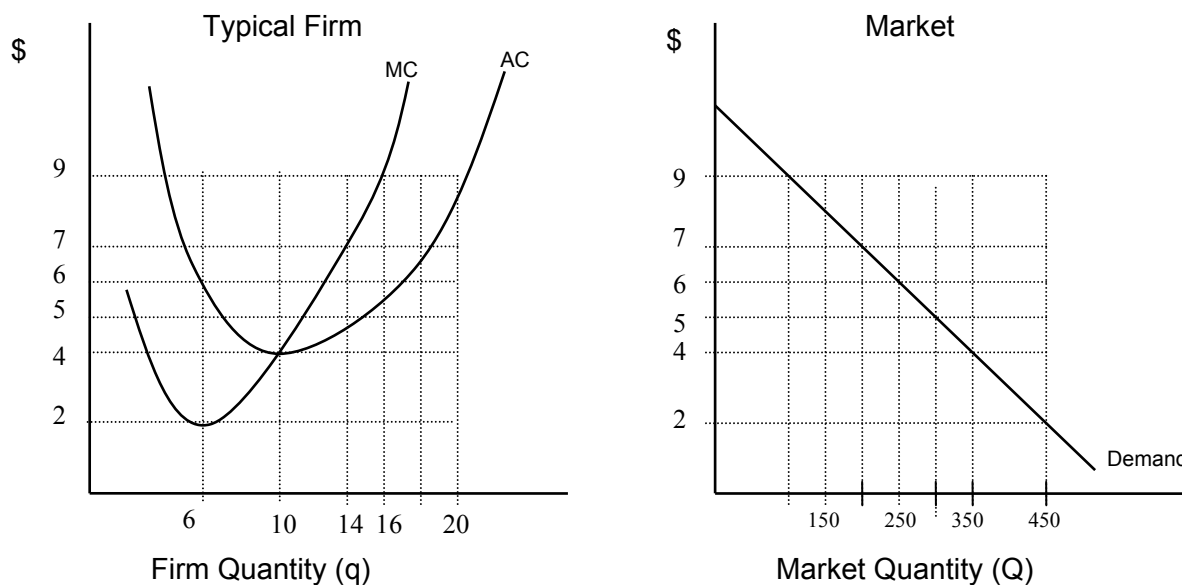
14.17. What is the long run equilibrium price?

A) 2   B) 4   C) 6   D) 7

14.18. Suppose a tax of \$2 per unit is levied on firms. What is the ratio of lost consumer surplus to tax revenue raised in long run equilibrium? (Note: this information pertains to Topic 11)

A) 7/5   B)   9/7   C)   6/5   D)   8/7

Questions 18-20. Refer to the figure below. The left panel of the figure depicts long run cost curves for a typical firm in a constant cost perfectly competitive industry. The right pane shows market demand.
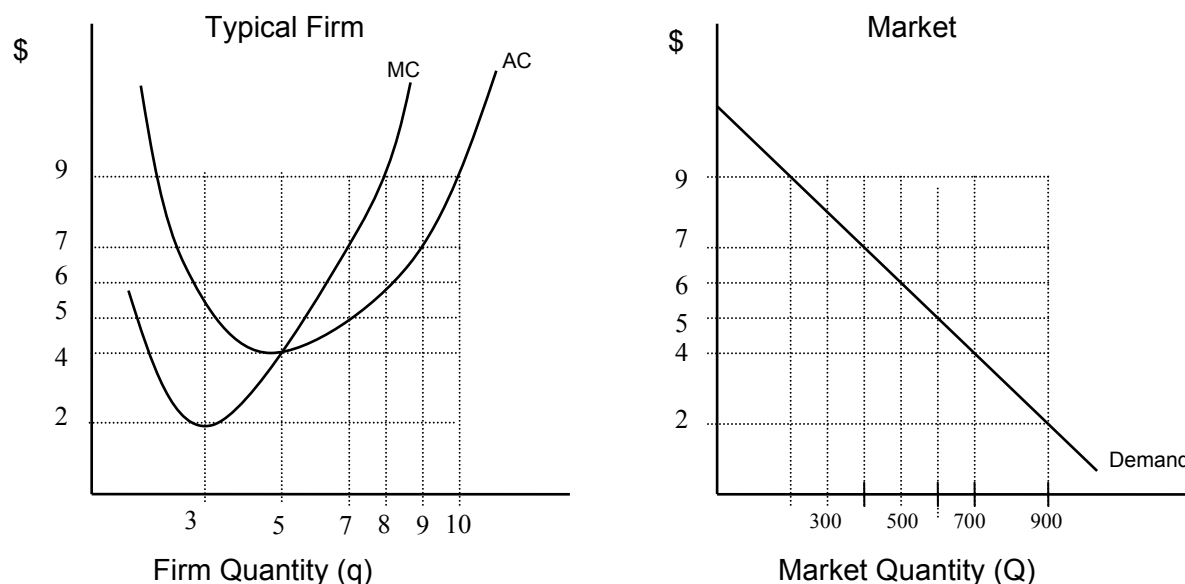
7.18.   What is the long run equilibrium price?
a)   2   b)   4   c)   7   d)   7.50

7.19.   How many firms will comprise the industry in the long run?
a)   40   b)   140   c)   180   d)   300

7.20.   Suppose a tax of $2 per unit is levied on firms. What is the ratio of lost consumer surplus to tax revenue raised in long run equilibrium? (Note, this information pertains to topic 11)
a)   7/5   b)   9/7   c)   6/5   d)   8/7

Questions 34-36 The figure below at left shows cost curves for a typical firm in a constant cost industry in which firms behave as price takers. The figure below at right shows market demand and the initial short run supply curve.
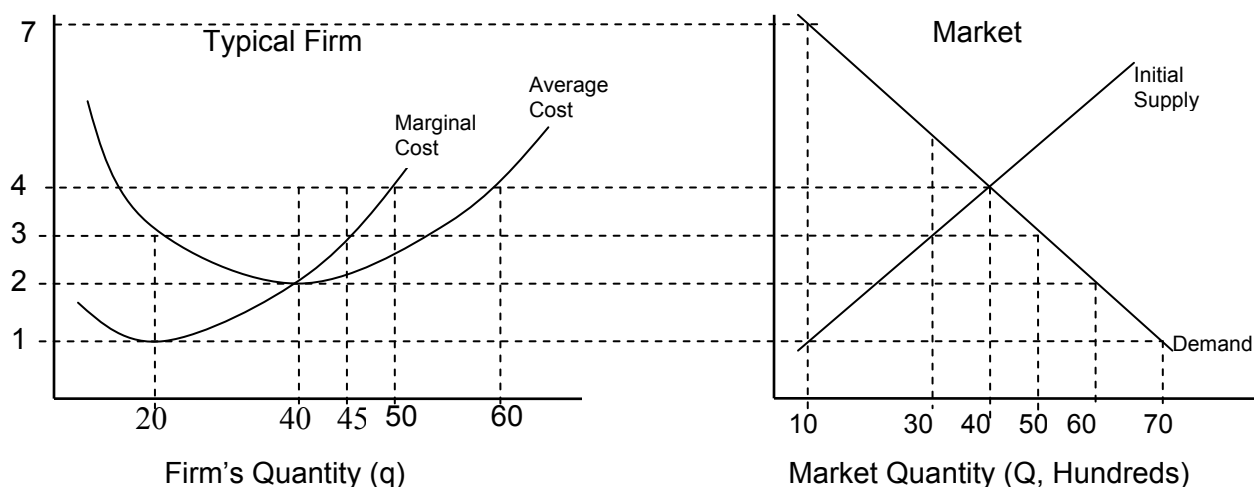
11.34. Suppose the government institutes a price ceiling of $1. What is the deadweight loss in the short run (using the initial supply curve)?
A) 6,000   B)   5,000   C)   12,000   D)   9,000

11.35. How many firms are in the industry in the long run?
A) 350   B)   100   C)   120   D)   150

11.36. Suppose the government institutes a per unit tax of $2. In the long run, tax revenue will be _____ and the deadweight loss will be _____. (Note, this information can be found in topic 11)
A) 4,000, 1,000   B) 8,000, 2,000   C) 10,000, 4,000   D) 6,000, 2,000

Questions 16.3-16.5 share common information.
16.2. Jonathon produces in a perfectly competitive industry. His cost function is $C(q) = 10 + 0.03q^3$. If the price is $36, how much should he produce to maximize profit?
A) 10   B)   30   C)   20   D)   40

16.3. Suppose market demand in Jonathon's industry is $Q_d = 40000p^{-0.5}$ and there are 300 total firms with the same cost function (given in the previous question). What is the initial (short run) equilibrium price?
A) 40   B)   60   C)   20   D)   10

16.4. Suppose the cost function given in the previous two questions is long run cost. What is the long run equilibrium price?
A) 18.91   B)   41.55   C)   9.51   D)   2.73

3.56. The figures below show current supply and demand conditions in a perfectly competitive industry, and, the long run marginal and average cost curves for a firm in that industry. All firms are identical, and, long run input costs are not affected by industry expansion or contraction. In the long run, what price will prevail and how much will individual firm's produce?

A) p_3 and q_4
B) p_3 and q_3
C) p_3 and q_2
D) p_2 and q_2
E) p_1 and q_1
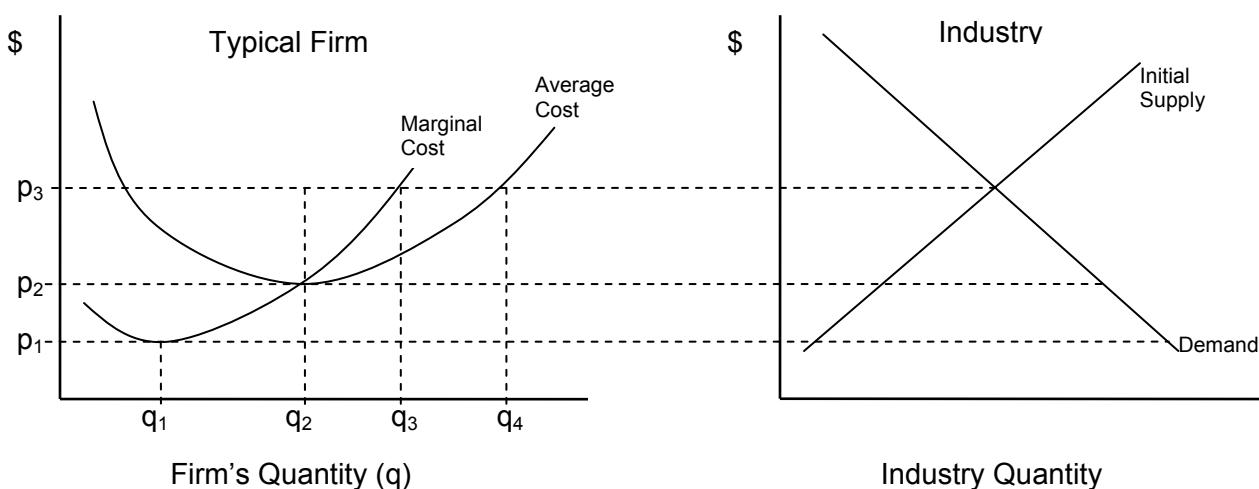
3.57. A perfectly competitive industry is composed of identical firms producing identical products with marginal cost given by $.25q$. If market demand is given by $Q = 5000 - 300p$, and there are currently 50 firms in the industry, what is the equilibrium price?

A) $.25   B) $.50   C) $2.50   D) $5   E) $10

CHAPTER 18. APPLICATIONS OF SUPPLY AND DEMAND ANALYSIS

TRUE FALSE

4.1.   Wealthier people are more likely to buy housing on the Coast. If taxes on Coastal development are increased to cover associated disaster relief and rebuilding costs, while at the same times a severe recession reduces real incomes, the price of coastal housing will decrease.

4.2.   Wealthier people are more likely to buy housing on the Coast. If taxes on Coastal development are increased to cover associated disaster relief and rebuilding costs, while at the same times a severe recession reduces real incomes, the quantity of coastal housing put in place will decrease.

20.10. The surplus created by a price floor is larger in the long run than in the short run.

20.11. Suppose the price of gasoline and the cost of tire production increase. Supply and demand analysis clearly indicates the quantity of tires will fall and the price of tires will increase.

Questions 22.22-23
Suppose the prices of chicken and pork (beef substitutes) increase at the same time a new technology lowers the cost of raising cattle.

22.22. The equilibrium price of beef will decrease.

22.23. The equilibrium quantity of beef will increase.

24.23. The new equilibrium quantity is 800.

24.24. The amount of government expenditure on subsidy payments is 400.

23.25. The deadweight cost of the subsidy program is 200.

MULTIPLE CHOICE

18.4. Consider a constant cost perfectly competitive industry in long run equilibrium. A tax of $4 per unit sold will cause the number of firms in the market to _____ and the number of units sold by the typical firm in the industry to _____ relative to the initial equilibrium.
A) decrease : decrease   B)   remain unchanged : decrease
C) decrease : increase   D)   decrease : remain unchanged

Demand in a perfectly competitive industry is approximated by $Q_D = 2000 - 200p_D$ and long run supply by $Q_S = 300p_S - 1000$. The initial equilibrium price is 6 and quantity is 800. Suppose an ad valorem tax of 50% is levied on all sales.

25.45. What is the after tax price received by producers?
A) 5   B) 7.5   C) 9   D) 10

25.46. What is the deadweight loss created by the tax?
A) 150   B) 225   C) 300   D) 375

6.19.   A new technology that causes a large increase in the fuel efficiency of automobiles
     will cause the wages of workers in the tire industry to _____ and the quantity employed to
     _____, all else equal.
A) decrease; decrease   B)   decrease; increase
C) increase; decrease   D)   increase; increase

1.2.   The building boom in China has driven up the price of concrete and lumber in the U.S. If
     the building boom in China collapsed, all else equal, the wages of construction workers in the
     U.S. would _____, and the number of construction workers employed in the U.S.
     would _____, all else equal.
A) increase, decrease   B) increase, increase
C) decrease, increase   D) decrease, decrease
E) none of the above

7.48.   A large increase in the Federal tax on motor fuels will _____ the price of tires and
          _____ the equilibrium quantity of tires.
a) increase, increase   b) decrease, increase
c) increase, decrease   d) decrease, decrease

16.6.   A government subsidy that decreases the interest rate (price) of home loans will
          _____ the cost of construction labor and _____ the quantity of construction
     laborers employed, all else equal.
A) increase : increase   B)   increase : decrease
C) decrease : increase   D)   decrease : decrease

Questions 7-8. Suppose market demand is linear and a $1 increase in price results in a 100 unit decline in quantity demanded. Supply is also linear and a $1 increase in price results in a 200 unit increase in quantity supplied.

16.7.   A tax of $3 per unit will result in a deadweight loss of
A)   200   B)   600   C)   100   D)   300

16.8.   Assuming initial equilibrium quantity was 1,000, what is the ratio of lost consumer and
     producer surplus to tax revenue raised by a $3 per unit tax?
A) 7/8   B)   9/8   C)   8/9   D)   1/8
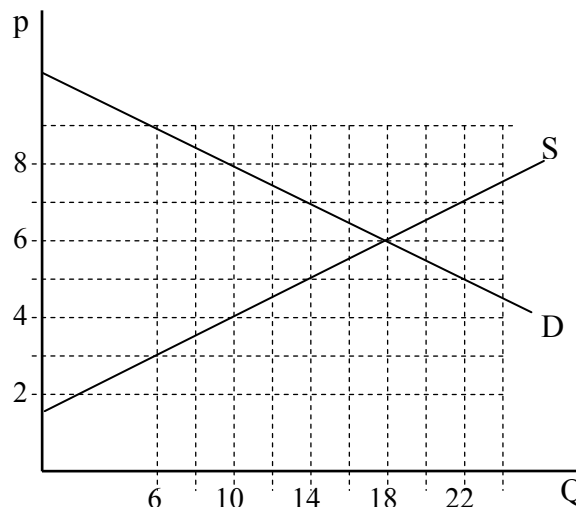
Questions 22.20-21
Refer to the figure to the right and suppose a tax of $2 per unit is levied on suppliers.

22.20. Revenue raised by the tax is ____.
A) 20   B) 24   C) 28   D) 36

22.21. Per dollar of tax revenue raised,
$_____ dollars of total surplus is lost.
A) 8/7   B) 3/2   C) 6/5   D) 7/5

Questions 17-20. The gadget market is perfectly competitive with supply and demand conditions unique to each city. The Federal government is considering imposing an ad valorem tax of 10% on gadget sales. The gadget trade association hired your firm to quantify the economic effects of the tax. You gathered 5000 monthly observations on quantity transacted, the price paid by consumers, population, and per capita income spanning 50 cities over 100 months (50X100=5000). Using that data, you used ordinary least squares regression to estimate demand, producing the results given in the table to the right.

Variable	Coefficient	Standard Error
Price (Dollars)	-100	200
Population (1000s)	20	15
Per Capita Income (1000s)	10	25
Constant	1000	75
Observations		5000
F(4,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		200

18.17. Taking the results at face value, estimate the equilibrium price if there is no tax in a city where per capita income is $30 (thousand), and population is 150 (thousand) and supply is $Q_S = -200 + 200p$.
A) 10   B) 15   C) 20   D) 25

18.18. Still taking the results at face value, consider the impact of the tax on market price in a city with the conditions given in the previous question. Specifically, estimate the equilibrium price including the tax paid by customers, p_D. (Hint, $p_D=1.1p_s$ where p_s is the price actually received by producers after the tax is paid.)
A) $p_D=16.50$ B) $p_D=11.00$ C) $p_D=21.76$ D) $p_D=15.97$

18.19. Consider a city where the equilibrium price with no tax would be 31 and the after tax equilibrium price paid by consumers would be $p_D=33$. Letting ΔQ represent the change in the equilibrium quantity due to the tax, what is the deadweight loss?
A) $1.5\Delta Q$ B) ΔQ C) $2\Delta Q$ D) $3\Delta Q$

Questions 15, 16, and 20 are under other topics

CHAPTER 19. MARKET STRUCTURE WRAP UP AND PRICING AND STRATEGIES FOR SPECIAL SITUATIONS

TRUE FALSE

3.23. Concentration measures such as the four-firm concentration ratio and the Herfindahl-Hirschman index will **understate** concentration if based on data that does not take into account penetration by foreign firms into U.S. markets.

5.8. Concentration measures such as the Herfindahl-Hirschman index will **understate** concentration if geographically isolated producers are treated as if they share a common market.

5.9.   Measures of market power based differences between market demand elasticity and firm level demand elasticity do not suffer from the same types of problems with market definition as do concentration indexes.

20.8. The problem with using observed mark up over marginal cost to measure market power is the difference between firm and market elasticity is hard to measure.

20.9. Calculating the Herfindahl Hirschman index for the ready-mix concrete industry by including all US firms underestimates the degree of concentration.

21.13. "Natural experiment" refers to using weather events to identify changes in price.

25.4. The hold up problem can be addressed in part by dual sourcing.
A) True   B) False

25.5. The hold up problem is due to the possibility of opportunistic behavior in the presence of relationship specific assets.
A) True   B) False

25.6. A vertically integrated firm must internally evaluate the output of an upstream division at a transfer price above marginal cost to provide proper incentives for the downstream division(s).
A) True   B) False

25.7. Increasing the number and scope of vertically intergraded firms increases the degree of division of labor in a free market economy.
A) True   B) False

25.47. The major advantage of concentration measures such as the Herfindahl-Hirschman Index (HHI) is that it is relatively easy to calculate.
A) True   B) False

25.48. The HHI dramatically overestimates the concentration of the ready mix concrete industry if it is calculated based on all national data.

25.50. Investing in capacity and low marginal cost production techniques, potentially well beyond the level that would maximize a monopolists profit, may be effective ways to commit to entry limit pricing or to engage in predatory pricing.
A) True   B) False

6.4. It is not a credible threat for a dominant incumbent firm to attempt to limit entry by setting a price below the profit maximizing level if the incumbent is known to be "rational" because an entrant will assume the incumbent will accommodate entry by choosing the profit maximizing price once entry has occurred.

6.5. Price match guarantees are good for consumers because they are likely to spark a price war as every firm tries to avoid administrative costs of administering refunds by setting prices low enough they never have to actually match any prices.

6.6. Hobbs Inc petitions the government to increase the stringency of licensing requirements in the market that they already strongly dominant. If the manager is maximizing profits, the only reasonable explanation is that the manager is attempting to increase brand loyalty by creating a public perception that Hobbs Inc is a socially responsible firm.

6.11. Firms that engage in penetration pricing by pricing below cost are inherently predatory and seek to enter a market by eliminating competition.

21.3. Low price and price match guarantees increase price competition.

21.9. Entry limit pricing may be used to maintain market share instead of investing in marginal cost reductions or developing a reputation as a fierce competitor, which are more expensive.

21.10. Penetration pricing can sometimes increase profits by paying customers to use your product.

21.11. Predatory pricing is not likely to be successful in general unless a credible commitment is made to maintaining low prices after the competitor exits.

21.14. Raising fixed costs for all firms in an industry can boost profit by limiting entry.

MULTIPLE CHOICE

2.14. When applying the Herfindahl-Hirschman index or concentration ratios to analyze market structure, which of the following is (are) true?

   I. Foreign sources of competing products must be excluded from consideration.
      II.   Otherwise identical producers in two cities are probably not in the same market if it is expensive to transport their products.
      III.   Products that are close substitutes should be considered part of the same market.
A)   I only   B)   III only   C)   II and III only
D)   I, II, and III   E)   none of the above

6.16.   Which of the following statements about measuring market power is NOT correct?
A) Market power may be measured by the difference in the market elasticity of demand and the elasticity of demand faced by an individual firm.
B) When measuring market power using the difference between price and marginal cost, assuming marginal cost is equal to average cost does not distort the results.
C) Issues with product characteristics and geography complicate the use of concentration indices to measure market power.
D) When sufficient data is available, measuring market power using the difference between market and firm demand elasticity or the difference between price and marginal cost is better than using concentration indices.

6.22.   In any industry with no significant barriers to entry, long run equilibrium is characterized by two types of conditions. They are:
A) AC=MC and P=MR   B)   MR=MC and P=AC
C) MR=MC and MC=AC   D)   MR=MC and P=MR

7.49.   Which of the following statements about measuring market power is NOT correct?
a) When measuring market power using the difference between price and marginal cost, assuming marginal cost is equal to average cost does not distort the results.
b) Market power may be measured by the difference in the market elasticity of demand and the elasticity of demand faced by an individual firm.
c) Issues with product characteristics and geography complicate the use of concentration indices to measure market power.
d) Measuring market power using the difference between market and firm demand elasticity or the difference between price and marginal cost is better than using concentration indices, data allowing.

11.29. When applying the Herfindahl-Hirschman index or concentration ratios to analyze market structure, which of the following is not true?
A) Foreign sources of competing products should be excluded from consideration.
B) If you want any credit, do not choose D, it is incorrect.
C) Otherwise identical producers in two cities are probably not in the same market if it is expensive to transport their products.
D) Products that are close substitutes should be considered part of the same market.

13.19.   Concentration ratios and the Herfindahl-Hirshman index overstate concentration if
A) geographically isolated markets are included in the market definition.
B) foreign sources of competition are included in market definition.
C) differentiated products that are nevertheless substitutes are excluded from the market definition.
D) The market definition is too broad.

13.20. A pitfall of using measured mark-up to indicate market power is that
A) it is often based on the assumption that cost per unit is constant.
B) it ignores the effects of temporal and geographic differentiation.
C) market wide demand elasticity is hard to define in differentiated product markets.
D) short run and long run demand elasticities differ.

16.1.   Prices are much nearer to cost in a contestable market with only one or a few firms than in a non contestable market with only one or a few firms because
A)   the department of justice regularly contests all significant price increases in such markets.
B)   the responsiveness of demand and low sunk costs make entry and exit easy.
C)   the department of justice is allowed to contest significant price increases in such markets.
D)   the firm had to legally commit to low prices to win the contest for the monopoly franchise.

16.9.   Recently the financial services industry has experienced a rash of consolidation as stronger firms buy out weaker ones threatened with bankruptcy. The Herfindahl Hirschman Index for the industry should have
A) increased.   B)   decreased.
C) stayed the same.   D)   not enough information.

16.10. When using observed firm level mark ups to measure market power, which of the following is a likely potential problem?
A) Firm level demand elasticities must be inferred based on the mark-up.
B) It may be difficult to determine which foreign firms are competitors.
C) It may be difficult to determine the geographic extent of the market.
D) True economic marginal cost is hard to measure.

Questions 39-41
Liz and Mike operate competing businesses on the opposite ends of a town that is one mile long. 100 potential customers are uniformly distributed along the only street through town. Customers will buy at most one unit per period. It costs customers $5 per mile distance from one of the businesses to make a round trip to make a purchase. Before subtracting transportation costs, each customer values a unit of the product at $20. The marginal cost of production is $10 for each firm. Let p_L denote the price charged by Liz and p_M denote the price charged by Mike. Capacities are unlimited.

25.39. What is the demand for Liz's product?
A) $50(p_M - p_L)$ B) $50 + 5p_M - 5p_L$ C) $50 + 10p_M - 10p_L$ D) $50 + 5p_M - 10p_L$

25.40. What is the Nash equilibrium price for Liz's product?
A) 10   B) 15   C) 25   D) 30

25.41. If the transportation cost became very low and approached 0, what would Liz's Nash equilibrium price approach?
A) 10   B) 15   C) 25   D) 30

2.4. A firm in a differentiated product industry introduces a new product that takes sales away from its existing product lines with no apparent increase the firm's total profitability. Which of the following is a likely rational explanation?
A) The new product was a complement that stimulated demand for existing products.
B) The new product reduced the cost of the existing product.
C) Since products are differentiated, product variety must increase or demand will fall over time.
D) The firm was attempting to fill an open niche before a competitor did so.
E) none of the above

2.9. A profit maximizing firm sells output produced at a constant marginal cost of $4 for $2. Which of the following are rational explanations?
     I. The firm is trying to break into a market in which consumers are locked into an incumbent.
     II. The firm is engaging in predatory pricing.
     III. The firm is using sales of this product to stimulate sales of a related good.
A) I only   B) III only
C) II and III only   D) I, II, and III
E) none of the above

2.8.   A firm currently makes $10 in profits facing a single competitor. There is only room for 2 firms in the market. This situation can continue indefinitely. Alternatively, the firm can engage in predatory pricing for one period, making a loss of $100. After that period, the firm will make a monopoly profit of $20 as long as no other competitors enter. The interest rate is 10%. Ignoring legal concerns, which of the following is true for a profit maximizing firm?
A)   The firm should not engage in predatory pricing since, even if no new competitor entered, the present value of profits is higher by accommodating the original competitor.
B)   The firm should engage in predatory pricing if sunk costs are such that no new competitor will want to enter.
C)   More information is needed on the efficiency of potential competitors to determine whether or not predatory pricing might increase profits.
D)   The firm should engage in predatory pricing because sunk costs are $100.
E)   none of the above

7.1.   Which of the following is **least** likely to sustain high profit for a firm with market power?
a) Producing an output level so far above the profit maximizing level for its cost structure that there is no room for an entrant to make a profit.
b) An increase in fixed costs of doing business larger than profits would be if another firm entered the market.
c) Moving along the learning curve to push marginal cost far below that of a potential entrant.
d) Investing in technology to lower marginal cost far below that of any rational entrant.

7.2.   Jamie and John share the gadget market, and Jamie makes $500 per year. This could continue for ten years, at which time gadgets will be obsolete. Since John has an inefficient cost structure, Jamie could drive John out of business this year by pricing aggressively and have the market herself for the following two years. If she did so, her firm would make $0 this year and then $800 for two years. After two years of monopoly, Diana would open a competing firm and Jaime would make only $500 per year again until gadgets become obsolete. If the discount rate is 20% and profits are received at the **beginning** of the period, driving John out of the market would _____ the value of Jaime's firm by _____.
a)   increase, $100   b)   increase, $36
c)   decrease, $67   d)   decrease, $42

10.7.   Becky enters the uWidget market to compete with Tina and Susana. Just before Becky decides on and posts her prices, Tina and Susana both publicize price match guarantees stating that they will beat any advertised competitor's price by 20%, and, will refund the difference plus the 20% to any customer who purchases and then later finds a lower price. The result of the price match guarantee will be _____ total profits for the firms but _____ prices for customers.
A) lower, lower   B) lower, higher
C) higher, lower   D) higher, higher

10.10.   Will is paying customers to take his gadgets. Which of the following are reasonable explanations?

I) Gadgets are demand complements to another product he sells.
II) He is trying to keep rivals from entering the market.
III) He is trying to break into a market characterized by significant network effects.

A) I only   B) I and III   C) II and III   D) I, II, and III

2.7. Which of the following statements about low price guarantees are true?
    I.   They always enhance consumer welfare by reducing uncertainty.
    II.   They reduce the price sensitivity of demand by reducing consumer information.
    III.   They reduce the ability of competitors to systematically undercut a firm's prices.
A)   I only   B)   III only
C)   II and III only   D)   I, II, and III
E)   none of the above

10.8.   Joel wants to prevent a competitor from entering his market. Which of the following is NOT likely to work.
A)   Producing so much more than the profit maximizing level that there would be no room for another firm to produce enough to cover their costs.
B)   Investing in technology to lower marginal cost to the point where the profit maximizing output level is so high that there is no room for another firm to produce enough to cover their costs.
C)   Producing so much over the next few years that he moves so far along the learning curve (learning how to efficiently produce and distribute the product) that his profit maximizing output level leaves no room for another firm to produce enough to cover their costs.
D)   Lobbying government officials for an increase in licensing fees and regulations that cause fixed cost to increase by more than his profit would be if there were another firm in the market but leaves marginal costs, and therefore the profit maximizing output level, unchanged.

10.9.   Billy-Bob wants to drive his competitor out of the market. If he continues as usual, he will make $10 per year this year for sure. For the next 3 years he will also make $10 per year IF the product has not become obsolete. After each year, though, there is a 0.5 probability that the product will become obsolete. After those 4 years, the product will be obsolete for certain. If he prices at his cost this year, he will make $0 this year, but, the competitor will go out of business. Then, for the next 3 years, he will make $20 per year IF the product has not become obsolete. For simplicity, assume the interest rate is 0% (no discounting). Driving his competitor out of the market
A) increases profit.   B) decreases profit.
C) leaves profit unchanged.   D) This is NOT the right answer.

13.1.   Price match guarantees
A) increase price competition.   B) insulate against price competition.
C) support differentiation.   D) promote horizontal equity.

13.18. Which of the following strategies is least consistent with rational decision making?
A) Pricing below the profit maximizing level to make it less attractive for competitors to enter.
B) Paying customers to try your product to build up a critical network size.
C) Investing more than would otherwise be justified in reducing marginal cost to deter entry.
D) Building more capacity than would otherwise maximize profits to deter entry.

14.19. Dan enters the Widget market to compete with Billy Bob and Bubba. Just before Dan decides on and posts his prices, Billy Bob and Bubba publicize price match guarantees stating that they will beat any advertised competitor's price by 5%, and, will refund the difference plus the 5% to any customer who purchases and then later finds a lower price. The result of the price match guarantee will be _____ total profits for the firms and _____ prices for customers.
A) lower, lower   B)   lower, higher
C) higher, lower   D)   higher, higher

16.15. The strategic effect of a price match guarantee is to
A) increase value added by reducing search costs.
B) systematically undercut competitor's prices.
C) increase value added by reducing uncertainty (insuring against price variation).
D) lead to higher prices.

18.21. Dan enters the Widget market to compete with Billy Bob and Bubba. Just before Dan decides on and posts his prices, Billy Bob and Bubba guarantee to meet ant competitor's price and to refund the difference plus 10% to any customer who purchases from them and later finds a lower price elsewhere. The result of the price match guarantee will be _____ total profits for the firms and _____ prices for customers.
A) lower, lower   B)   lower, higher
C) higher, lower   D) higher, higher

CHAPTER 20. INPUT PROCURMENT AND INCENTIVE CONTRACTS

TRUE FALSE

3.9. When designing an optimal contract to motivate risk averse agents to put forth effort when there is uncertainty and moral hazard, expected salary payments will be higher than required to motivate the same level of effort with perfect information, since building incentives into a contract also entails building in risk.

3.10. When attempting to motivate effort, incentive plans should be predominantly tied to profit, since that is the bottom line that everyone should be trying to maximize, even if the link between profit and the individual employee's responsibilities is weak.

3.11. Suppose you are a buyer designing an optimal procurement contract when cost might be either high or low and the supplier will discover whether costs are high or low, but you will not. Then, when choosing the quantity for the contract option you intend to be selected if cost turns out to be high, the marginal benefit of another unit is above the marginal production cost to keep the producer honest in case cost turns out to be low.

5.3. When designing an optimal contract to motivate risk averse agents to put forth effort when there is uncertainty and moral hazard, expected salary payments will be lower than required to motivate the same level of effort with perfect information, since risk averse agents will work harder in part just to reduce the risk of a low salary.

5.4. When attempting to motivate effort, incentive plans should be predominantly tied to whatever signals are most closely associated with the agent's unobservable performance, even if those signals are only moderately correlated with profit.

5.5. Suppose you are a buyer designing an optimal procurement contract when cost might be either high or low and the supplier will discover whether costs are high or low during production, but you will not. Then, the optimal quantity for the contract option you intend to be selected if cost turns out to be low will balance the marginal benefit of another unit with its marginal cost plus an adjustment necessary to keep the producer honest.

6.7. You never have to worry about the lowest cost producer participating when using a procurement contract to overcome adverse selection.

3.12. Screening for health insurance and stringent enforcement of insider trading laws are necessitated by asymmetric information, not uncertainty.

MULTIPLE CHOICE

Questions 22.24-25
Sara designs an optimal input procurement contract when the supplier has better information on the cost of the input.

22.24. All profit is extracted from the supplier if cost is low because that is when profit potential is highest.

22.25. Quantity if cost turns out high balances the direct increase in profit from an additional unit against the additional profit lost if cost turns out low.

Questions 41-43
Alex wants to hire Sarah to run her finance department. Sarah's next best option is a position that pays $100 and requires only an ordinary amount of effort. To head Alex's finance department satisfactorily, however, takes a great deal of effort. Sarah's utility function is $u(w,e) = \sqrt{w} - C(e)$, where C(e) is the utility cost of effort. If Sarah works hard, C(e) is 5, and, if she does not work hard, C(e) is 0. The only signal as to whether or not Sarah works hard on which an incentive contract can be based is profit. The probability of high profit is .5 if Sarah works hard, while the probability of high profit is 0 if Sarah does not work hard. Assume Alex wants to offer the incentive contract that motivates Sarah to take the job and to work hard at the lowest expected cost. Let w_H represent the wage to be paid if profits are high, and, w_L represent the wage to be paid if profits are low.

3.41. What are the participation and incentive compatibility (selection) constraints for Alex's problem?

A) $.5\sqrt{w_H} + \sqrt{w_L} - 5 = 10 \quad and \quad .5\sqrt{w_H} + .5\sqrt{w_L} = \sqrt{w_L}$

B) $.5\sqrt{w_H} + .5\sqrt{w_L} - 5 = 10 \quad and \quad .5\sqrt{w_H} + .5\sqrt{w_L} - 5 = .5\sqrt{w_L}$

C) $.5\sqrt{w_H} - 5 = 10 \quad and \quad .5\sqrt{w_H} - 5 = \sqrt{w_L}$

D) $.5\sqrt{w_H} + .5\sqrt{w_L} - 5 = 10 \quad and \quad .5\sqrt{w_H} + .5\sqrt{w_L} - 5 = \sqrt{w_L}$

3.42. What wage does Sarah earn if profits are high? (Round to whole dollars)
A) 10　　　　B) 20　　　　C)100　　　　D) 225　　　　E) 400

3.43. What wage could Alex offer to get Sarah to take the job and work hard if there were perfect information?
A) 15　　　　B) 150　　　　C) 225　　　　D) 250　　　　E) 300

6.21. Which of the following was not discussed in class as something that can lead to pitfalls in contract design?
A) The possibility of the ratchet effect.
B) Lack of commitment.
C) Unforeseen incentives for counterproductive behavior.
D) Cost padding and over billing.

Questions 44 – 46
Mike's is now negotiating a procurement contract for custom thingamabobs. The value of the thingamabobs to Mike, before subtracting his expenditures on the contract, is given by $10q - .5q^2$. There is a .5 probability that the thingamabobs will turn out to cost \$2, and, a .5 probability that they will turn out to cost \$3. Mike is negotiating with David's custom manufacturing firm to produce the thingamabobs. David will learn the true cost before actually producing the thingamabobs. Let P_H and q_H stand for the contract payment and quantity intended if cost turns out to be high and let P_L and q_L stand for the contract payment and quantity to be delivered if cost turns out to be low.

3.44.   Which of the following are the binding participation and selection constraints for Mike's contract design problem?
A) $P_L - 2q_L = P_H - 2q_H$ *and* $P_H - 3q_H = 0$
B) $P_H - 3q_H = P_L - 3q_L$ *and* $P_L - 2q_L = 0$
C) $P_L - 2q_L = P_H - 2q_H$ *and* $P_L - 2q_L = 0$
D) $P_H - 3q_H = P_L - 3q_L$ *and* $P_H - 3q_H = 0$

3.45.   What is the quantity specified in the contract option intended for selection if cost turns out to be low?
A) 4   B) 6   C) 8   D) 10
E) 12

3.46.   What is the price specified in the contract option intended for selection if cost turns out to be low.
A) 12   B) 16   C) 18   D) 22   E)   24

11.33. Suppose you are a buyer designing an optimal procurement contract when cost might be either high or low and the supplier will discover whether costs are high or low during production, but you will not. Which of the following is true of the optimal contract?
A) The quantity to be produced if cost turns out to be high balances the marginal benefit of another unit with its marginal cost.
B) The quantity to be produced if cost turns out to be low balances the marginal benefit of another unit with its marginal cost plus an adjustment necessary to keep the producer honest.
C) The quantity to be produced if cost turns out to be low balances the marginal benefit of another unit with its marginal cost.
D) You never have to worry about the high cost producer participating.

Questions 17-18
Alex wants to hire Sarah to run her finance department. Sarah's next best option is a position that pays $9 and requires only an ordinary amount of effort. To head Alex's finance department satisfactorily, however, takes a great deal of effort. Sarah's utility function is
$u(w,e) = \sqrt{w} - C(e)$, where C(e) is the utility cost of effort. If Sarah works hard, C(e) is .75, and, if she does not work hard, C(e) is 0. The only signal as to whether or not Sarah works hard on which an incentive contract can be based is profit. The probability of high profit is .75 if Sarah works hard, while the probability of high profit is 0 if Sarah does not work hard. Assume Alex wants to offer the incentive contract that motivates Sarah to take the job and to work hard at the lowest expected cost. Let w_H represent the wage to be paid if profits are high, and, w_L represent the wage to be paid if profits are low.

5.17.   What are the participation and incentive compatibility constraints for Alex's problem?
A) $.75\sqrt{w_H} + .25\sqrt{w_L} - .75 = 3 \quad and \quad .75\sqrt{w_H} + .25\sqrt{w_L} = \sqrt{w_L}$
B) $.75\sqrt{w_H} + .25\sqrt{w_L} - .75 = 3 \quad and \quad .75\sqrt{w_H} + .25\sqrt{w_L} - .75 = .25\sqrt{w_L}$
C) $.75\sqrt{w_H} - .75 = 10 \quad and \quad .25\sqrt{w_H} - .75 = \sqrt{w_L}$
D) $.75\sqrt{w_H} + .25\sqrt{w_L} - .75 = 3 \quad and \quad .75\sqrt{w_H} + .25\sqrt{w_L} - .75 = \sqrt{w_L}$

5.18.   What wage does Sarah earn if profits are high? (Round to whole dollars)
A) Less than $15   B) $15 to $19.99
C) $20 to $29.99   D) $30 or more.

6.50.   Stanley's Investments is trying to lure Gunther away from Retirement Tactics, where he currently earns $90,000 annually. Gunther's utility function is $u(w,e) = 4w^5 - C_e$ where w is money wages, e is unobservable effort exerted, and C_e is the utility cost of effort. Assume the utility cost of effort required in his current position is 0 but that it will be 100 if he moves to Stanley's. With hard work, Gunther's work at Stanley's has a 75% chance of success. Success is valuable enough to Stanley's that they want to ensure Gunther works hard by offering an incentive contract. How much will Stanley's offer to pay Gunther if he accepts Stanley's offer and is then successful?
A) $0 to $99,999   B) $100,000 to $124,999
C) $125,000 to $149,999   D) $150,000 or more

Questions 19 - 20
Mike's is now negotiating a procurement contract for custom thingamabobs. The value of the thingamabobs to Mike, before subtracting his expenditures on the contract, is given by $\ln(q)$. There is a .75 probability that the thingamabobs will turn out to cost $0.10 and a .25 probability that they will turn out to cost $0.20. Mike is negotiating with David's custom manufacturing firm to produce the thingamabobs. David will learn the true cost before actually producing the thingamabobs. Let P_H and q_H stand for the contract payment and quantity intended if cost turns out to be high and let P_L and q_L stand for the contract payment and quantity to be delivered if cost turns out to be low.

5.19.   Which of the following are the binding participation and selection constraints for Mike's contract design problem?
A) $P_L - .1q_L = P_H - .1q_H$ and $P_H - .2q_H = 0$
B) $P_H - .2q_H = P_L - .2q_L$ and $P_L - .1q_L = 0$
C) $P_L - .1q_L = P_H - .1q_H$ and $P_L - .1q_L = 0$
D) $P_H - .2q_H = P_L - .2q_L$ and $P_H - .2q_H = 0$

5.20.   What is the quantity specified in the contract option intended for selection if cost turns out to be high?
A) Less than 2.49 B) 2.5 to 3.99 C) 4 to 5.49 D) 5.5 or more

7.29. When a buyer is designing an optimal contract to procure an input from a supplier when the supplier will have better information about the cost of making the input, the quantity called for if cost turns out to be high is less than the level that would otherwise be optimal. Why?
a) To reduce the cost of keeping the producer happy if cost turns out to be high.
b) To reduce the cost of keeping the producer honest if cost turns out to be high.
c) To reduce the cost of keeping the producer happy if cost turns out to be low.
d) To reduce the cost of keeping the producer honest if cost turns out to be low.

11.20. The impact of rampant insider information on a stock market is an example of
_____, while the tendency to drive less carefully in a rented car is an example of
_____.
A) adverse selection, moral hazard   B) moral hazard, adverse selection
C) endowment effects, moral hazard   D) moral hazard, endowment effects

Questions 27 and 28. Risky Inc. wants to lure Sarah away from Small Ltd. to head their finance department. Sarah is risk averse. Her utility function is $u(w) - c$ where w is income and c is the cost of Sarah's unobservable and uncontractible effort. The cost of effort is 0 if Sarah does not work hard and c_H if she does. Risky Inc. will make high profits with probability f if Sarah works hard and 0 if she does not. Let CE stand for the certainty equivalent wealth of Sarah's job at Small Ltd. Let w_L stand for the payment to Sarah if profits are low and w_H be Sarah's payment if profits are high.

7.27. Which of the following describes the solution to Risky's contract design problem are?

a) $fu(w_H) + c_H = u(CE)$ b) $u(w_H) = (CE + c_H)/f$

c) $u(w_H) = u(CE) + c_H/f$ d) $u(w_H) = CE + c_H/f$

7.28. Let the amount in excess of the certainty equivalent that Sarah would have to be paid to compensate for the disutility of high effort be represented by v_H. Which of the following represents the extra expected wage cost incurred by Risky to hire Sarah and motivate high effort due to the presence of uncertainty and moral hazard? (That is, how much lower would expected labor cost be with perfect information?)

a) $f(w_H - CE) + v_H$ b) $f(w_H - CE) - v_H$

c) $fw_H - CE + v_H$ d) $fw_H - CE$

14.1. The fact that those that are less likely to suffer losses are willing to pay less for full insurance is an example of _____.

A) Moral Hazard   B)   Adverse Selection   C)   Free Riding   D)   Hold-Up

Questions 21-23
Michelle wants to hire Morgan to manage her new restaurant chain. Morgan's utility function is $u(w) - d(e)$ where w is her income and d(e) is the cost of effort in terms of utility. If Morgan works hard, the probability the new chain will succeed is 0.6 and the disutility of effort is 10. If she does not work hard, the probability the new chain will succeed is 0.2 and the disutility of effort is 0. At her current job, Morgan's utility is 50.

11.21. What are the participation and incentive constraints that Michelle must meet if she wants to hire Morgan and motivate her to work hard, assuming effort is not observable and success or failure is the only signal on which to base an incentive contract. (Letting w_H stand for salary if the chain is successful and w_L stand for salary if it is not successful.)

A) $0.6u(w_H) + 0.4u(w_L) - 10 = 50$ and $0.6u(w_H) + 0.4u(w_L) - 10 = 0.2u(w_H) + 0.8u(w_L)$

B) $0.2u(w_H) + 0.8u(w_L) - 10 = 50$ and $0.2u(w_H) + 0.8u(w_L) - 10 = 0.6u(w_H) + 0.4u(w_L)$

C) $0.6u(w_H) + 0.2u(w_L) - 10 = 50$ and $0.6u(w_H) + 0.2u(w_L) - 10 = 0.4u(w_H) + 0.8u(w_L)$

D) $0.6u(w_H) + 0.6u(w_L) - 10 = 50$ and $0.6u(w_H) + 0.6u(w_L) - 10 = 0.2u(w_H) + 0.2u(w_L)$

11.22. If the likelihood of success if Morgan does not work hard were higher, the optimal
    incentive contract would call for _____ pay if the restaurant is successful and _____ pay
    if it is not successful, and expected compensation costs will be _____ compared to what
    they would be with perfect information
A) lower, lower, lower   B)   higher, lower, higher
C) higher, lower, lower   D)   higher, higher, higher

11.23. Michelle is considering hiring Juan to conduct a study to get better information on the
chances of success (assuming Morgan works hard). Michelle thinks there is a 0.6 probability
Juan's report will be favorable. If the report is favorable, the Michele thinks the probability of
success is 0.8. If the report is not favorable, Michelle thinks the probability of success is only
0.4. The report also affects profits given success or failure since it allows Moran's compensation
package to be more finely tailored to the situation. With a favorable report, success means a
profit of $220 and failure means a loss of $40 (a negative profit), including all costs of Morgan's
compensation. Without the report, success means a profit of $180 and failure means a loss of $60
(a negative profit), including all costs of Morgan's compensation. With an unfavorable report,
success means a profit of $140 and failure means a loss of $100 (a negative profit), including all
costs of Morgan's compensation. What is the most Michelle should be willing to pay Juan to
conduct such a study?
A) 16.8   B)   84   C)   15.2   D)   168

Questions 7 and 8
    Big Inc. is designing an incentive contract for Jon, whose level of effort is not directly
observable or contractible. The only signal on which to base incentives is profit. If Jon works
hard, profit will be $5,000 with probability 0.8 and $1,000 otherwise. If he does not work hard,
the probability of high profit is 0.6. Jon's utility function is $u = w^{0.5} - d$ where w is Jon's salary
and d, the disutility of effort, is 4 if effort is high and 0 if effort is not high. Jon's current job
requires high effort and pays $400.

14.7.   Letting H and L denote outcomes when profit is high or low, respectively, the incentive
    constraint for Big Inc.'s problem is

A) $0.8w_H^{0.5} + 0.2w_L^{0.5} - 4 = 0.6w_H^{0.5} + 0.4w_L^{0.5}$

B) $0.8w_H^{0.5} + 0.2w_L^{0.5} - 4 = 0.6w_H^{0.5} + 0.4w_L^{0.5} - 4$

C) $0.8w_H^{0.5} + 0.6w_L^{0.5} - 4 = 0.4w_H^{0.5} + 0.2w_L^{0.5}$

D) $0.8w_H^{0.5} + 0.6w_L^{0.5} - 4 = 0.2w_H^{0.5} + 0.4w_L^{0.5} - 4$

14.8.   If the probability of high profit with low effort decreases, the wage paid if profit is high

A) remains constant.   B)   increases.
C) decreases.   D)   increases by 0.8/0.6.

17.15. Which of the following is an example of adverse selection?
A) A banker making risky loans because he thinks the government will pay his losses.
B) A person who has health insurance is more likely to engage in unhealthy behavior.
C) People who know they are at higher risk for diabetes are more willing to buy health insurance.
D) An employee slacks when his coworkers bear the cost of his lack of productivity.

17.16. Cory knows a hurricane is coming, so he buys plenty of supplies in advance. When the hurricane comes, the government gives out free supplies to people who didn't prepare. Cory decides to not prepare as well the next time a hurricane is expected. In economics, this an example of _____.
A) moral hazard   B)   adverse selection
C) hold up   D)   social responsibility

Questions 17-20
Marianna wants to hire Morgan to manage her new restaurant chain. Morgan's utility function is $u(w) - d(e)$ where w is her income and $d(e)$ is the disutility of effort (the cost of effort in terms of utility). If Morgan works hard, the probability the new chain will succeed is 0.6 and the disutility of effort is 4. If she does not work hard, the probability the new chain will succeed is 0.2 and the disutility of effort is 2. At her current job, Morgan's utility is 10.

17.17. What are the participation and incentive constraints that Marianna must meet if she wants to hire Morgan and motivate her to work hard, assuming effort is not observable and success or failure is the only signal on which to base an incentive contract. (Letting w_H stand for salary if the chain is successful and w_L stand for salary if it is not successful.)
A) $0.6u(w_H) + 0.6u(w_L) - 4 = 10$ and $0.6(u(w_H) - u(w_L)) = 2$

B) $0.2u(w_H) + 0.8u(w_L) - 4 = 10$ and $0.8(u(w_H) - u(w_L)) = 6$

C) $0.6u(w_H) + 0.2u(w_L) - 4 = 10$ and $0.4(u(w_H) + u(w_L)) = 4$

D) $0.6u(w_H) + 0.4u(w_L) - 4 = 10$ and $0.4(u(w_H) - u(w_L)) = 2$

17.18. Suppose $u = 18w/(20 + w)$. With perfect information, the cost of hiring Morgan to work hard, w_C, is given by
A) 60   B) 40   C) 70   D) 50

17.19. Which of the following represents the extra cost of hiring Morgan to work hard due to uncertainty and information asymmetry?
A) $0.6w_H + 0.4w_L - w_C$ B) $0.6u(w_H) + 0.4u(w_L) - 10$
C) $0.6w_H + 0.6w_L - w_C$ D) $0.6u(w_H) + 0.6u(w_L) - 4$

17.20. If the likelihood of success if Morgan works hard were higher, the optimal incentive contract would call for _____ pay if the restaurant is successful and _____ pay if it is not successful, and expected compensation costs will be _____.
A) higher, lower, higher   B)   lower, higher, lower
C) higher, lower, lower   D)   lower, higher, higher

Questions 11-13 Marianna wants to hire Morgan to manage her new restaurant chain. Morgan's utility function is $\dfrac{20w}{20+w} - d(e)$ where w is her income and $d(e)$ is the disutility of effort (the cost of effort in terms of utility). If Morgan works hard, the probability the new chain will succeed is 0.6 and the disutility of effort is 4. If she does not work hard, the probability the new chain will succeed is 0.4 and the disutility of effort is 2. Morgan's next best option is a job where $w=20$ and $d(e)=0$.

18.11. In the optimal incentive contract, what wage is called for if the chain fails?
A) 13.33   B)   3.67   C)   20   D)   15

18.12. What is the cost of hiring Morgan to work hard with perfect information (w_C)?
A) 60   B)   56.33   C)   46.67   D)   24

18.13. What is the extra cost of hiring Morgan to work hard due to uncertainty and information asymmetry?
A) $0.6u(w_H)+0.6u(w_L)-4$ B) $0.6u(w_H)+0.4u(w_L)-24$
C) $0.6w_H+0.6w_L-w_C$ D) $0.6w_H+0.4w_L-w_C$

Questions 24-26
You must contract with a custom manufacturer to procure widgets. The value you place on the widgets is $V(q)=5q-0.25q^2$. The total cost of producing them will be either low, $C_L=100+0.5q_L$, or high, $C_H=200+q_H$. All you know is the probability of low cost is 0.3. You can make a take it or leave it contract offer of a quantity to deliver and a total payment if cost is low (q_L,P_L) and a quantity to deliver and a total payment if cost is high (q_H,P_H). The manufacturer can not be held to the contract if they would take a loss.

18.24. What is the binding selection constraint for this contracting problem?
A) $P_L-100-0.5q_L=P_H-100-0.5q_H$ B) $P_L-100-0.5q_L=P_H-200-q_H$
C) $P_L-100-0.5q_L=P_L-200-q_L$ D) $P_L-200-q_L=P_H-200-q_H$

18.25. What is the quantity called for in the contact if cost is low?
A) 6   B) 8   C) 9   D) 11

18.26. Suppose you get a consultant's report that convinces you the probability of low cost is higher than you originally thought. What happens to the quantity called for when cost is high?
A) It increases.   B)   It decreases.
C) It remains the same.   D)   It might increase or decrease.

Questions 13 & 14 Contracting with Moral Hazard
Willi needs to motivate Laura to take a job at his firm and to work hard. If she does not work hard, the firm's profit will be 0 for certain. If she works hard, there is a 0.5 probability of a profit of 100. Laura's utility is $u = 0.9 - \dfrac{1000}{w}$ if she works hard and $u = 1.1 - \dfrac{1000}{w}$ if she does not work hard, where w is her salary. Her utility at her next best alternative job is 0.5. Let w_H represent pay if profit is high and w_L represent pay if profit is low.

25.13. Which of the following represents the incentive constraint Willi must meet?
A) $\dfrac{500}{w_L} + \dfrac{500}{w_H} = 2$ B) $\dfrac{500}{w_L} + \dfrac{500}{w_H} = 0.2$ C) $\dfrac{1000}{w_L} - \dfrac{1000}{w_H} = 2$ D) $\dfrac{500}{w_L} - \dfrac{500}{w_H} = 0.2$

25.14. Which of the following represents the participation constraint Willi must meet?
A) $\dfrac{500}{w_L} + \dfrac{500}{w_H} = 0.4$ B) $\dfrac{500}{w_L} + \dfrac{500}{w_H} = 0.6$ C) $\dfrac{500}{w_L} - \dfrac{500}{w_H} = 0.6$ D) $\dfrac{500}{w_L} - \dfrac{500}{w_H} = 0.4$

Questions 22.26-32
Tara's Gadgets wants to offer Dunai an incentive contract to take over as CEO. The probability the firm's value will be high if Dunai works hard is f=0.8. If she does not work hard, the probability the firm's value will be high is g=0.3. Let w_H and w_L represent the wage in the contract if value is high or low, respectively. Dunai's utility function is $u = 7 - \dfrac{10}{w}$ if she works hard and $u = 10 - \dfrac{10}{w}$ is she does not work hard. Dunai's reservation utility is 5.

22.26. With complete and perfect information, how much would Dunai have to be paid to induce her to work for Tara and to work hard?
A) 2   B) 5   C) 10   D) 15

22.27. What are the participation and incentive constraints for Tara's problem with incomplete and asymmetric information?
A) $7 - \dfrac{8}{w_H} - \dfrac{2}{w_L} \geq 5$ and $7 - \dfrac{8}{w_H} - \dfrac{3}{w_L} \geq 10 - \dfrac{2}{w_H} - \dfrac{7}{w_L}$
B) $7 - \dfrac{8}{w_H} - \dfrac{3}{w_L} \geq 5$ and $7 - \dfrac{8}{w_H} - \dfrac{3}{w_L} \geq 10 - \dfrac{2}{w_H} - \dfrac{7}{w_L}$
C) $7 - \dfrac{8}{w_H} \geq 5$ and $7 - \dfrac{8}{w_H} \geq 10 - \dfrac{3}{w_L}$
D) $7 - \dfrac{8}{w_H} - \dfrac{2}{w_L} \geq 5$ and $7 - \dfrac{8}{w_H} - \dfrac{2}{w_L} \geq 10 - \dfrac{3}{w_H} - \dfrac{7}{w_L}$

Questions 22.28-29: Suppose f decreases to 0.7 and g increases to 0.4.

22.28. w_L increases.

22.29. Expected compensation costs increase because the contract becomes more risky for the agent.

Questions 22.30-32
Suppose Dunai's contract contains clauses specifying rules of public conduct, for purposes of maintaining the firm's public image. If Dunai violates any of these clauses, the firm can pay her w_L, fire her, and void the incentive clauses in the contract, right up to the day the bonus is due. If value turns out high the firm might therefore try to avoid paying her bonus (w_H-w_L) by claiming she violated the conduct clauses, even though she will not *actually* violate them. If they do so, Dunai will take them to court. If she wins, she will receive a judgment of (w_H-w_L)+P, where P represents punitive damages. If the firm fires her and voids the incentive clauses with no evidentiary support, Dunai will win in court for certain. However, there is a 0.5 chance the firm will acquire evidence of an event that *appears* to violate the conduct clauses. In that case, the probability Dunai will be able to prove she was wrongfully denied her bonus in court is only 0.6. For simplicity, suppose Dunai's court costs are 0 and she will always go to court if she is fired. Further, suppose it costs the firm K to go to court.

22.30. If value is high and the firm acquires evidence of an apparent violation of the conduct clauses, the firm will fire Dunai if _____.
A) $0.6(w_H - w_L) > P + K$ B) $w_H - w_L > 0.6(P + K)$
C) $0.4(w_H - w_L) > 0.6P + K$ D) $w_H - w_L > 0.6P + K$

22.31. Assume the values of P and K are such that both Tara and Dunai know Dunai will be fired and the parties will end up in court if the firm's value turns out high and the firm has evidence of an apparent violation of one of the conduct clauses. Also assume f=0.8. and g=0.3 from the original set up above. From the perspective of the point in time when the incentive contract is signed, the probability of a lawsuit is _____.
A) 0.35   B) 0.5   C) 0.48   D) 0.4

22.32. Continue with the assumptions from the previous question. Which of the following represents the participation constraint for Tara's contracting problem in this environment?
A) $7 - \dfrac{2.4}{w_H + P} - \dfrac{4}{w_H} - \dfrac{3.6}{w_L} \geq 5$

B) $7 - \dfrac{6}{w_H + P} - \dfrac{2}{w_H} - \dfrac{2}{w_L + P} \geq 5$

C) $7 - \dfrac{2.4}{w_H + P} - \dfrac{4}{w_H} \geq 5$

D) $7 - \dfrac{5}{w_H + P} \geq 5$

CHAPTER 21. THE FIRM

TRUE FALSE

4.11.   If producing two products jointly reduces fixed costs, to maximize profits, more of each will necessarily be produced when the goods are produced jointly than when they are produced separately.

4.12. If producing two products jointly lowers the marginal cost of one of the products, to maximize profits, more of that product will necessarily be produced when the goods are produced jointly than when they are produced separately.

3.24. When an upstream monopoly that produces inputs and a downstream monopoly that purchases those inputs and produces a final product merge, consumers are better off because the final price is lower since it no longer reflects double marginalization.

3.6.   In team production situations when the value of what is produced by the team is split up among the team members, workers should set their individual marginal benefit equal to their individual marginal cost of effort to maximize joint value net of all costs of effort.

3.7.   When attempting to solve problems with Free Riding in team production situations, never work with people who are "crazy" in that they have developed reputations for behaving in ways that would be economically irrational in a one shot game.

3.8.   When attempting to solve problems with Free Riding in team production situations, avoid allowing stockholders to become the "residual claimants".

25.49. If a vertically integrated firm that has market power in its upstream division charges prices above the monopoly level to firms that compete with its downstream division, its total profit may decrease.
A) True   B) False

Questions 22.33-35
Esteban is the only provider of an upstream component used by Nicole, and she is his only customer. Nicole requires one unit of the upstream component for every unit she produces.

Inverse demand for Nicole's product is $p = 40 - \dfrac{q}{4}$. Esteban's constant marginal cost is 5 and

Nicole's constant marginal cost is 10.

22.33. If each maximizes profit individually, inverse demand upstream is $p_U = 25 - q$.

22.34. If they don't solve the double marginalization problem, quantity falls short of the jointly optimal level by 25 units.

22.35. Suppose they form a single firm with an upstream and a downstream division. Optimal transfer pricing means the upstream division should be internally evaluated by valuing its output at the price it would have sold for if the firms had not merged.

22.38. Adding more players to a team alleviates free riding.

22.39. An important reason firms exist is to mitigate adverse effects of high transactions costs.

22.40. Relationship specific investments lead to overcapitalization to protect against opportunistic behavior.

22.41. Incomplete, imperfect, and implicit contracts and information asymmetry increase the value added by a CEO with a credible reputation as an honest arbiter of internal disputes.

Questions 27 and 28
Billy Bob is currently in a market characterized by high transaction costs, a need for team production, and relationship specific investments. Fortunately for Billy, contracting happens to be reasonably simple, contracts are easily enforced, and, there is a very small amount of uncertainty concerning contracts.

3.27. Billy should utilize the spot market due to the high transaction costs and need for team production.

3.28. Billy should primarily implement external contracts, thus taking advantage of specialization, because contracting is simple and reasonably certain.

5.10. It makes the most sense to obtain highly non-standardized inputs in the spot market if high levels high levels of uncertainty or judgment proof trading partners make contracting infeasible.

MULTIPLE CHOICE

7.22.   A merger between an upstream monopoly and a downstream monopoly that did not coordinate pricing decisions efficiently before the merger will
a) likely be blocked because it raises the Herfindahl-Hirshman Index.
b) increase the price paid by final consumers by introducing double marginalization.
c) decrease the price paid by final consumers by reducing double marginalization
d) likely be blocked to prevent collusion in pricing.

6.25.   You have recently developed a new product in a very profitable niche in a differentiated product industry. You are concerned about how to maintain your profits, since you know that your competitors will be quick to take advantage and produce products like yours. Which of the following is LEAST LIKELY to insulate you from competitive entry?
A) Introducing products in nearby niches that will compete with your own product.
B) Advertising to inform consumers about your product and create brand loyalty.
C) Lowering your marginal cost of production.
D) Increased government safety regulations that increase fixed costs of producing similar products.

2.12.   A vertically integrated firm with market power evaluates the performance of the personnel of its upstream and downstream divisions based on the division's profitability. To provide incentives for overall profit maximization, it is important that the upstream firm's output be valued at
A) the marginal cost of the last unit of the upstream firm's output.
B) at the maximum willingness to pay of the downstream firm.
C) at the monopoly price of the upstream firm's output.
D) at a fraction of the final price equal to the upstream share of costs.
E) none of the above

2.13. If an upstream monopoly that produces inputs and a downstream monopoly that purchases those inputs and produces a final product merge, which of the following is true?
A)   Consumers are worse off because there is even more monopoly power, resulting in higher prices.
B)   Total profit is higher because the integrated firm can raise prices.
C)   The merger is almost certain to be challenged by the department of justice since it increases the Herfindahl-Hirschman index to 10000.
D)   Nothing changes from a consumer's perspective, because both firms were already monopolies.
E)   none of the above

6.29.   Suppose an upstream division of a monopoly produces a product which is then distributed for sale by a downstream division. To provide appropriate incentives to maximize shareholder profit when designing compensation packages for management of the upstream division, the upstream divisions output should be valued internally at
A) the monopoly price.   B)   marginal cost.
C) average cost.   D)   average variable cost.

10.5.   An upstream monopoly merges with a downstream monopoly that is their only customer. The result will be _____ total profits for the firms but _____ prices for customers.
A) lower, lower   B) lower, higher
C) higher, lower   D) higher, higher

10.6.   Two firms with market power that produce products viewed as complements by consumers merge. The result will be _____ total profits for the firms but _____ prices for customers.
A) lower, lower   B) lower, higher
C) higher, lower   D) higher, higher

11.25. In which of the following is NOT a way in which integrating multiple stages of production in a single firm can increase efficiency?
A) Increasing specialization.
B) Reducing search and bargaining costs.
C) Eliminating double marginalization.
D) Mitigating problems created by relationship specific investments.

11.26. An upstream monopoly merges with a downstream monopoly that is their only customer. The result will be _____ total profits for the firms but _____ prices for customers.
A) higher, higher   B)   lower, higher
C) higher, lower   D)   lower, lower

11.28. A firm in a differentiated product industry introduces a new product that takes sales away from its existing product lines with no apparent increase the firm's total profitability. Which of the following is a likely rational explanation?
A) The firm was attempting to fill an open niche before a competitor did so.
B) The new product was a complement that stimulated demand for existing products.
C) The new product reduced the cost of the existing product.
D) Since products are differentiated, product variety must increase or demand will fall over time.

12.15.   If producing goods two goods together reduces fixed cost and leaves variable cost unchanged, _____ will be produced to maximize profit compared to when they are produced in separate firms. If producing two goods together lowers the marginal cost of the goods, _____ will be produced.
 A) more, more
B) the same quantity, more
C) the same quantity, the same quantity
D) More information is requires to answer this question.

13.15. Goods A and B are demand complements and are priced by a single monopoly firm. If the goods instead were priced independently and non-cooperatively by two firms, one that was the only provider of A and one that was the only provider of B, then overall, profits would be _____ and prices would be _____.
A) lower ; lower   B) lower ; higher
C) higher ; lower   D) higher ; higher

14.14. A firm in a differentiated product industry introduces a new product that takes sales away from its existing product lines with no apparent increase the firm's total profitability. Which of the following is a likely rational explanation?

A) The new product was a complement that stimulated demand for existing products.
B) The new product reduced the cost of the existing product.
C) Since products are differentiated, product variety must increase or demand will fall.
D) The firm was attempting to fill an open niche before a competitor did so.

6.17.   Which of the following is a way to eliminate free riding in team production situations with unverifiable individual effort?
A) Increasing the size of the team, so that there will be more team members to monitor one another, thus making it easier to catch free riders.
B) Contracts between team members basing individual compensation on total team production, and assigning contract enforcement to the individual team members.
C) Contracts between team members and external party basing compensation for individual team members on total team production and assigning contract enforcement to the external party.
D) Working only with players that have reputations for always behaving in ways that are economically rational in one shot games.

6.20.   When obtaining inputs that require large specific investments in a complex and uncertain environment, it likely makes the most sense for a firm to:
A) Purchase the inputs in the spot market.
B) Contract with external firms to procure inputs.
C) Use dual-sourcing to obtain the inputs.
D) Integrate and produce the inputs internally.

6.23.   Which of the following is NOT a potential solution to the holdup problem?
A) Contracting   B)   Vertical integration
C) Horizontal integration   D)   Dual sourcing

Question 38 - 39
Having sold their gadget venture, Ray and Nick have now come up with a new and improved way to produce widgets! Working together, the value they can create is given by
$V = 20e_r + 20e_n + .5e_r e_n - .5e_r^2 - .5e_n^2$, where e stands for effort. The cost of effort, the amount you would have to pay Ray and Nick to induce them to willingly put forth that much effort, is given by $4e_r$ for Ray and $2e_n$ for Nick, respectively.

3.38.   If Ray and Nick simply split the total value evenly and each treats widgit production as a non-cooperative game and maximize their individual surplus given the behavior they expect of the other, what is Nick's reaction function?
A) $e_n = 20 + .5e_r$ B) $e_n = 16 + .5e_r$
C) $e_n = 8 + .25e_r$ D) $e_n = 16 + .25e_r$

3.39.   In the non-cooperative Nash equilibrium, Ray puts forth 26.667 units of effort. How much effort does Nick exert? (Round to 2 digits)
A) 26.12   B) 28.67   C) 29.33   D) 30.17   E) 31.75

3.40.   If Nick and Ray cooperate efficiently, the optimal amount of effort for Ray is 33.33. What is the optimal effort for Nick? (Round to 2 digits)
A) 31.53   B) 33.33   C) 34.67   D) 37.42   E) 38.75

Questions 15-16
Matt can effectively sell inventory management software to Craig only if he first invests in learning a great deal about Craig's operation. The gains from trade for any given level of investment by Matt (I) are given by $6I - .25I^2$. Assume bargaining power is such that once the investment is sunk, if no previously negotiated and enforceable contract is in place, the gains from trade will be divided evenly between Matt and Craig.

5.15. How much would Matt invest to maximize his share of the gains from trade, less his investment?

A) Less than 5   B)   5 to 6.99
C) 7 to 8.99   D)   9 or more

5.16. How much does the threat of opportunistic behavior on Craig's part reduce Matt's investment in the transaction, compared to the jointly efficient level?

A) Less than 1.5   B)   1.5 to 2.99
C) 3 to 4.99   D)   5 or more

6.37. Will and Chris start a joint venture in which, working together, the value they can create is given by $V = 20\ln(e_w) + 20\ln(e_c)$, where e stands for effort. The cost of effort, the amount you would have to pay Will and Chris to induce them to willingly put forth that much effort, is given by $2e$ for both Will and Chris. How much lower is total surplus (value less the cost of effort) if Will and Chris simply split the total value evenly and each treats widget production as a non-cooperative game and maximize their individual surplus given the behavior they expect of the other compared to the case where they work as a team?

A) $40\ln(20) - 40\ln(10) - 40$ B) $20\ln(10) - 20\ln(5) - 20$
C) $20\ln(10) - 20\ln(5) - 10$ D) $40\ln(10) - 40\ln(5) - 20$

6.47. Joe and Bob have decided to enter into a project which requires an initial investment by each of them. The total gain from trade, once investments are sunk, is given by $V = 5I_J + 5I_B - .05I_J^2 - .05I_B^2$. Assuming that Joe and Bob split any gains from trade evenly between them, and that they both anticipate opportunistic behavior from the other after the investments are made, what is the difference between the efficient total investment and the actual total investment?

A) $0 to $29.99   B) $30 to $59.99
C) $60 to $89.99   D) $90 or above

7.40. Medium Inc. needs to procure a specialized input that will require relationship specific investments by both the buyer and the seller. Contracts are readily enforceable through the legal system and there is little uncertainty. Medium Inc. should most likely do which of the following?

a)   Utilize the spot market to fully exploit the specialization flowing from the relationship specific investment.
b)   Construct a procurement contract to prevent exploitation of either party by the other.
c)   Integrate and use internal contracts to limit the scope of hold up problems.
d)   Integrate to take full advantage of bilateral specialized investment.

Questions 41-43.   Ray and Lindsay are leaving ECP 3703 Associates to start their own venture. The total value of the venture is given by $V = 10e_L + 10e_R + 0.25e_L e_R$ where e_R and e_L stand for Ray's and Lindsay's effort. The cost to each of their own effort is given by $C_R = 0.5e_R^2$ and $C_L = 0.5e_L^2$. Ray and Lindsay will simply split the gross value generated.

7.41.   If the two cooperate and maximize the value of the venture less the total cost of effort, the optimal choice of Lindsay's effort must satisfy which of the following?
a) $e_L = 10 + 0.25e_R$ b) $e_L = 5 + 0.125e_R$
c) $e_L = 5 + 0.25e_R$ d) $e_L = 10 + 0.125e_R$

7.42.   If the two approach the venture non-cooperatively and each seeks to maximize their own individual surplus, which of the following gives Lindsay's reaction function?
a) $e_L = 10 + 0.25e_R$ b) $e_L = 5 + 0.125e_R$
c) $e_L = 5 + 0.25e_R$ d) $e_L = 10 + 0.125e_R$

7.43.   How much less effort does Lindsay put forth in the non cooperative solution than in the cooperative solution?
a) 5.71   b) 7.62   c) 13.33   d) 15.24

Questions 1-3 Jethro must invest relationship specific human and physical capital to facilitate a purchase of Critters from Ellie Mae. The gross post-investment value is given by $V = 6J - .03J^2$ where J is the amount invested by Jethro. Bargaining power between Jethro and Ellie Mae is such that the result of any negotiation (or renegotiation) will result in Jethro receiving one third (1/3) of what is under negotiation and Ellie Mae receiving two thirds (2/3).

10.1.   How much should Jethro invest if he anticipates Ellie Mae will renegotiate the terms of any prior agreement they have reached once the investment is sunk?
A) 50   B) 66.67   C) 70.00   D) 83.33

10.2.   Suppose Jethro hires Ms. Jane to monitor the initial agreement and Jethro's resulting investment. The initial agreement calls for Ellie Mae to receive two-thirds (2/3) of V but also to reimburse Jethro for two-thirds of his investment, since the entire net surplus is at stake at the time of the initial negotiation. There is a 0.5 probability that with Ms. Jane as a witness, Jethro will be able to hold Ellie Mae to the initial agreement. If he can't, he will only receive one third of V with no compensation for his investment as a result of renegotiation after the investment is sunk. Now how much should Jethro invest to maximize his expected profit?
A) 50   B) 66.67   C) 70.00   D) 83.33

10.3.   Jethro and Ellie Mae could merge to form a firm, hiring a tough CEO with a reputation for honestly and appropriately settling disputes. If the CEO enables them to achieve the efficient investment level, and if the best possible contracting solution leads to an investment of $70, what is the most Jethro and Ellie should be willing to pay the CEO?
A) 3   B) 5.33   C) 8.33   D) 12

10.4.　　In which of the following ways can integrating multiple stages of production in a single firm increase efficiency?
I) Controlling free rider problems.
II) Reducing search and bargaining costs.
III) Eliminating double marginalization.
IV) Increasing specialization.

A) IV only　　　　　　B) III and IV
C) I, II, and III　　　　D) I, II, III, and IV

Questions 30 and 31
Mari and Jon enter into a joint venture in which they design software to help students master Managerial Economics. They will split proceeds from sales of the software equally. If both work hard, total proceeds will be $200. If neither works hard total proceeds will be $50. If one works hard and the other does not, total proceeds will be $128. Both Mari's and Jon's utility functions are given by $u(\pi,e) = \sqrt{\pi} - d$, where π is the individual's share of proceeds and d is the cost of effort in utility terms, or, the disutility of effort. The disutility of working hard is 5, and the disutility of working but not hard is 1.

11.30.　Treating the situation as a one shot simultaneous move game, in the Nash Equilibrium, Mari's payoff is _____ and Jon's is _____.
A) 3, 3　　　　　　B)　5, 5　　　　　C)　4, 4　　　　　D)　7, 7

11.31.　Suppose that there are opportunities to punish partners that free ride, for example by giving bad recommendations. There is no immediate economic reward to delivering such punishments but there are costs in terms of time and effort. Mari has played games like this many times. She has always worked hard and has always gone out of her way to punish partners that free ride. Jon is not concerned about his reputation. Jon thinks Mari will work hard with probability 0.8 and that Mari will actually punish him if he free rides with probability 0.4. John will be indifferent between working hard and free riding if the cost to him of being punished is equal to _____ units of utility.
A) 9　　　　B)　3　　　　　C)　2.5　　　　D)　4.5

14.32.　Which of the following is a way to eliminate free riding in team production situations with unverifiable individual effort?

A)　Increasing the size of the team, so that there will be more team members to monitor one another, thus making it easier to catch free riders.
B)　Contracts between team members basing individual compensation on total team production, and assigning contract enforcement to the individual team members.
C)　Contracts between team members and external party basing compensation for individual team members on total team production and assigning contract enforcement to the external party.
D)　Working only with players that have reputations for always behaving in ways that are economically rational in one shot games.

Questions 33- 34

Will and Chris start a joint venture in which, working together, the value they can create is given by $V = 100e_w + 100e_c$, where e stands for effort. The cost of effort, the amount you would have to pay Will and Chris to induce them to willingly put forth that much effort, is given by $5e^2$ for both Will and Chris.

14.33. Assuming they simply split gross value in the end, how much effort does each put in if they play non-cooperatively?

A) 2.5　　　　B) 5　　　　C) 10　　　　D) 25

14.34. How much lower is total surplus (value less the cost of effort)　　　if they simply split the total value evenly and treat widget production as a non-cooperative game and maximize their individual surplus given the behavior they expect of the other compared to the case where they work as a team?

A)　125　　　　B)　250　　　　C)　750　　　　D)　1000

14.35. Medium Inc. needs to procure a specialized input that will require relationship specific investments by both the buyer and the seller. There is a great deal of uncertainty, and, little is known about possible contingencies. Medium Inc. should most likely do which of the following?

A)　Utilize the spot market to fully exploit the specialization flowing from the relationship specific investment.
B)　Construct a procurement contract to prevent exploitation of either party by the other.
C)　Integrate and use internal contracts to limit the scope of hold up problems.
D)　Reduce adverse selection in by learning more before investing

Questions 36-38

Dugan must invest relationship specific capital to facilitate a purchase from Gavin. The gross post-investment value is given by $V = 200I^{0.5}$ where I is the amount invested by Dugan. Bargaining power is such that the result of any negotiation (or renegotiation) will result in Dugan receiving one quarter (1/4) of what is under negotiation and Gavin receiving three quarters (3/4).

14.36. How much should Dugan invest if he anticipates Gavin will renegotiate the terms of any prior agreement they have reached once the investment is sunk?

A)　25　　　　B)　81　　　　C)　256　　　　D)　625

14.37. Suppose Dugan hires Marti to monitor the initial agreement and Dugan's resulting investment. The initial agreement calls for Gavin to receive three-quarters (3/4) of V but also to reimburse Dugan for three quarters of his investment, since the entire net surplus is at stake at the time of the initial negotiation. The probability that Dugan will be able to hold Gavin to the initial agreement with Marti's records is f (the probability is 0 without a monitor). If he can't, renegotiation after the investment is sunk will result in a split of V with no compensation to Dugan for his investment. Which of the following now represent's the first order condition (optimization condition) for Dugan's problem?

A) $\dfrac{dV}{dI} - 1 = 0$ B) $\dfrac{dV}{dI} - 1 + f = 0$

C) $\dfrac{1}{4}\dfrac{dV}{dI} - 1 + \dfrac{3}{4}f = 0$ D) $\dfrac{1}{4}\dfrac{dV}{dI} - \dfrac{3}{4}f = 0$

14.38. Suppose the solution to Dugan's problem with Marti is to invest I_M. and the solution without a monitor is I_N. Which of the following represents the most Dugan would pay for the information provided by Marti?

A) $V(I_M - I_N) - (I_M - I_N)$ B) $\left(\dfrac{V(I_M)}{4} - \left(1 - \dfrac{3}{4}f\right)I_M\right) - \left(\dfrac{V(I_N)}{4} - I_N\right)$

C) $\left(V(I_M) - I_M\right) - \left(V(I_N) - I_N\right)$ D) $\left(\dfrac{V(I_M)}{4} - f\dfrac{3}{4}I_M\right) - \left(\dfrac{V(I_N)}{4} - \dfrac{I_N}{4}\right)$

18.23. An upstream monopoly merges with a downstream monopoly that is their only customer. The result will be _____ total profits for the firms and _____ prices for final consumers.
A) higher, higher   B) lower, higher   C) higher, lower   D) lower, lower

Questions 33 and 34
Luke and Dugan start a joint venture to help students master Managerial Economics. They will split proceeds evenly. If both work hard, total proceeds will be $1800. If neither works hard total proceeds will be $200. If one works hard and the other does not, total proceeds will be $800. Both have utility functions given by $u(\pi, e) = \sqrt{\pi} - d$, where π is the individual's share of proceeds and d is the cost of effort in utility terms, or, the disutility of effort. The disutility of working hard is 15, and the disutility of working but not hard is 0.

18.33. Treating the situation as a one shot simultaneous move game, what is Luke's Nash Equilibrium payoff?
A) 20   B) 10   C) 15   D) 5

18.34. Suppose the interest rate is 0.1. If Luke and Dugan will play repeatedly, what is the highest probability that their line of work will become obsolete after any given play for which cooperation is possible?
A) 0.25   B)   0.6   C)   0.5   D)   0.45

Questions 38-40
Gayle must invest relationship specific capital to facilitate a purchase from Jimmy. The gross post investment value is given by $V(I)$ where I is the amount she invests. Bargaining power is such that the result of any negotiation will result in Gayle receiving one third (1/3) of what is under negotiation.

18.38. What is the first order condition for Gayle's problem if she anticipates Jimmy will renege on the initial agreement once the investment is sunk?

A) $\dfrac{dV}{dI} - 1 = 0$　　　　B) $\dfrac{dV}{dI} - \dfrac{1}{3} = 0$　C) $\dfrac{1}{3}\dfrac{dV}{dI} - 1 = 0$　D) $\dfrac{1}{3}\dfrac{dV}{dI} = 0$

18.39. Suppose Gayle hires Caroline to monitor the initial agreement and her investment. The initial agreement calls for Jimmy to receive two-thirds (2/3) of V but also to reimburse Gayle for two thirds of her investment. The probability Gayle will be able to hold Jimmy to the initial agreement with Caroline's records is f (the probability is 0 without a monitor). If she can't, renegotiation will result in a split of V with no additional compensation to Gayle for her investment. What is the first order condition for Gayle's problem now?

A) $\dfrac{dV}{dI} - 1 = 0$　　　　　　　B) $\dfrac{1}{3}\dfrac{dV}{dI} - 1 + \dfrac{1}{3}f = 0$

C) $\dfrac{1}{3}\dfrac{dV}{dI} - 1 + f\dfrac{2}{3} = 0$　　　D) $\dfrac{dV}{dI} - \dfrac{2}{3}f = 0$

18.40. Suppose the solution to Gayle's problem having hired Caroline is to invest I_C and the solution without a monitor is I_N. What is the most Gayle would pay Caroline?

A) $\left(\dfrac{V(I_C)}{3} - \left(1 - \dfrac{2}{3}f\right)I_C\right) - \left(\dfrac{V(I_N)}{3} - I_N\right)$

B) $\dfrac{V(I_C - I_N)}{3} - (I_C - I_M)$

C) $\left(\dfrac{V(I_C)}{3} - f\dfrac{2}{3}I_C\right) - \left(\dfrac{V(I_N)}{3} - I_N\right)$

D) $\left(\dfrac{V(I_M)}{3} - f\dfrac{2}{3}I_M\right) - \left(\dfrac{V(I_N)}{3} - \dfrac{I_N}{3}\right)$

Questions 22.36-37
Amanda and Bill can together produce a product worth $V = 16e_A e_B$ where e_A and e_B represent the

effort exerted by Amanda and Bill, respectively. The individual cost of effort is $C(e) = \dfrac{e^3}{3}$ for

each of them.

22.36. If they evenly split the value created after effort is exerted and play non-cooperatively, Amanda's reaction function is _____.

A) $e_A = \sqrt{16e_B}$　　　B) $e_A = \sqrt{8e_B}$　　　C) $e_A = 8e_B$　　　D) $e_A = 4e_B$

22.37. In the non cooperative solution, Bill's effort is _____ less than in the cooperative solution.
A) 4   B) 6   C) 8   D) 12

Questions 8-10
Andrew and Brandie each put effort, e, into a joint project that will produce a gross value of
$V(e_A, e_B)$. Effort is measured in the number of dollars it would take to get them to work that
hard, so $C(e) = e$ for both of them. Effort is not is not directly verifiable or contractible.

25.8. If they split V evenly, which of the following determines Andrew's reaction function? (MB
represents the derivative of V with respect to effort.)
A) $MB_A = 2MB_B$ B) $MB_A = MB_B$ C) $MB_A = 2$ D) $MB_A = 1$.

Now suppose they hire Lisette to serve as a monitor. Lisette will be able to identify a free rider
with probability f. They then sign the following contract. They agree up front to each put in the
"efficient" level of effort, e^*, which maximizes their joint surplus. They also agree anyone who
Lisette does not catch free riding will receive half of the gross value. The share of anyone Lisette
"catches" free-riding will be donated to a specified charity. The contract is enforceable, and
Lisette has an incentive to make sure it is enforced to maintain her reputation. Suppose Andrew
expects Brandie to put in the efficient effort level, e^*. Let $\tilde{e}_A$ represent Andrew's optimal effort
if he then decides to free ride ($\tilde{e}_A < e^*$). Let $\tilde{V}$ represent value if Brandie puts in effort e^* and
Andrew free rides, putting in effort of $\tilde{e}$. Also, let V^* represent value if neither free rides.

25.9. Which of the following represents the difference between the marginal benefit of Andrew's
effort if he free rides and if he does not, $MB_A(\tilde{e}_A, e^*) - MB_A(e^*, e^*)$?

A) $\dfrac{1+f}{1-f}$ B) $\dfrac{2}{1-f}$ C) $1+f$ D) $2(1-f)$.

25.10. Which of the following must hold for Andrew to choose to put in the efficient effort level
rather than free riding (under the contract described above if he expects Brandie to put in effort
of e^*)? That is, which of the following must hold for it to be a Nash Equilibrium for Andrew and
Brandie to provide the efficient effort level under the contract described in the question above?
A) $V^* - (1-f)\tilde{V} \geq 2(e^* - (1-f)\tilde{e})$
B) $V^* - (1-f)\tilde{V} \geq 2(e^* - \tilde{e})$
C) $V^*/2 - \tilde{V} \geq (e^* - \tilde{e})$
D) $V^* - \tilde{V} \geq (e^* - \tilde{e})$

SPECIAL TOPICS

11.1.   The Arrow Impossibility Theorem says that it is impossible to:
A) make a straight arrow.
B) fail ECP 3703 if you did all the problems, discussions, extra credit, and get an exam average of 57 AFTER the curve and replacing poor early grades with later ones if higher. [While true, this is not the right answer.]
C) formulate an electoral procedure or social choice rule that is stable and always achieves socially desirable outcomes.
D) achieve an optimal balance between risk and incentives if there are relationship specific investments or free riding issues.

11.2.   A pure public good is one that:
A) can only be traded on pure and open public markets.
B) is usually impure if produced by a private firm.
C) can only be produced by public agencies.
D) is non-rival and non-excludable in consumption.

14.2.   The possibility of external, or spillover, benefits to education may be an argument for public _____ of education.
A) financing   B)   provision   C)   regulation   D)   taxation

14.3.   In public K-12 education, teacher salaries increase _____ than in private jobs early in a career and _____ later in a career.
A) faster, faster   B)   faster, slower
C) slower, faster   D)   slower, slower

18.10. The possibility of external benefits is an argument for public _____ of education.
A) provision   B)   financing   C)   regulation   D)   execution

25.1. Teacher salaries rise more slowly than salaries in most jobs early in a career, and, more rapidly near the end of a career, likely due to union influence.
A) True   B) False

25.2. Pure public goods are non rival and non excludable.
A) True   B) False

25.3. Negative externalities create severe transaction costs and therefore reduce the equilibrium quantity below the efficient level.
A) True   B) False

OLD MULTIPLE CHOICE EXAM KEYS

WARNING In almost all cases, there is one right answer, and, it is the one indicated in the key. BUT, in the process of combining all of these questions, ordering them by topic, etc… some error(s) may have slipped through. If you find a question for which you are convinced the key is wrong, please help us and your classmates out by asking about it on the discussion board.

Q	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38
1	d	a	b	b	b	a	a	c	a	a	c	c	b	b	a	b	a	b	b	a	a	a	b	a	a													
2	b	b	a	a	a	b	d	c	b	b	d	d	d	a	b	c	b	c	c	b	a	b	a	a	a													
3	c	b	b	b	b	b	c	b	a	b	c	a	c	c	c	a	d	a	a	b	b	a	b	b	b													
4	c	d	a	b	a	a	b	c	a	c	b	b	c	b	d	d	d	d	c	a	a	b	b	b	a													
5	b	b	a	a	b	b	c	d	c	c	d	c	b	a	a	c	c	b	a	a	b	d	b	b	a													
6	a	d	b	b	a	b	a	a	b	c	c	d	d	d	d	a	d	a	d	b	a	d	a	a	b													
7	d	b	b	a	b	a	c	c	a	d	c	c	a	a	b	d	b	d	c	b	a	c	a	b	b													
8	c	a	b	b	a	b	d	c	c	a	b	a	d	c	c	b	b	a	a	b	b	a	a	b	c													
9	c	d	a	a	b	a	b	d	a	b	b	b	b	b	d	a	c	c	a	a	b	a	b	a	a													
10	e	c	b	b	b	b	d	b	c	b	a	c	a	d	b	d	b	b	b	a	a	b	a	a	b													
11	b	c	a	b	a	b	d	c	b	d	d	b	d	c	b	b	c	a	b	b	a	a	b	b	c													
12	a	a	a	a	b	b	c	d	d	b	a	a	c	d	a	a	b	c	c	a	b	b	b	b	b													
13	c	e	b	b	d	b	b		b	d	d	b	c	a	d	c	c	d	d	b	b	b	b	b	d													
14	b	c	b	b	b	b	a		d	b	a	c	d	d	c	b	a	d	a	d	a	a	b	a	a													
15	a	c	b	d	c	b	d				b	b	b	b	b	d	c	a	d	a	b	b		a	b													
16	a	b	a	d	b	b	c				d	d	d	d	c	d	a	c	b	d	c	b		a	a													
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18	b	d	b	b	b	b	b				c	b	a	c	b	b	c	d		b	b	c		b	a													
19	d	b	b	b	a	d	b				b	d	c	d	a	c	a	a		c	c	a		a	d													
20	b	d	a	a	a	d	c				a	c	a	a	a	a	b	a		a	d	c	a	a	b													
21		a	b			d	b				a			a			d					a		a	b													
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26		a	a			c	d				c			d			b							b	d													
27		b	c			a	c				a			b			d							d	b													
28		a	b			b	b				a			c			a							b	a													
29		b				b	d				a			c			c							a	b													
30		a				c	c				c			a			a							c	a													

(CONTINUED)

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31			b			c	b				d			b				d				d			a													
32			c			b	d				c			c				b				a			b													
33			c			b	d				c			b				b				b			c													
34			d			b	a				d			b				d				a			c													
35			b			d	b				d			c				b				b			d													
36			b			d	c				b			d				d				b			b													
37			b			d	a				d			c				b				c			b													
38			b			a	c							b				c				b			a													
39			c			b	a											c				a			c													
40			c			b	b											a				b			b													
41			d			a	a															a			a													
42			e			d	b															a			b													
43			c			c	b															b			b													
44			a			d	a															a			b													
45			c			b	c															b			a													
46			d			c	d															d			d													
47			a			a	a															d			a													
48			b			b	d															a			b													
49			e			c	a															c			a													
50			b			b																b			a													
51			a			b																																
52			b			B																																
53			d			C																																
54			b			A																																
55			a			C																																
56			d			B																																
57			e			B																																
58			a																																			
59			c																																			
60			d																																			

OLD SHORT ANSWER EXAM QUESTIONS

Questions appear in the chronological order in which they were given. However, after the number of each question, the topic number and name from the current course outline is also listed. Use these category names to decide which questions to study for each test, NOT the test number on which the question originally appeared, since the order of topics has been changed. A key for all questions is included at the end. As always, if you spot any problems, let us know!

SUMMER 2006 EXAM 1

Name_____   UFID#_____

SHORT ANSWER 1. (15 Points) *7. GAME THEORY*

Dan hires Amy for one year, and one year only. If Amy works hard, Dan's payoff is $200 and Amy's is $100. If Amy shirks, Dan's payoff is $50 and Amy's is $150. After the year is over, Dan can punish Amy if she shirks by going out of his way to make sure she has a hard time finding other work that pays well. Inflicting this punishment costs Dan $50 and costs Amy $200. The costs of punishment are in addition to other payoffs.

A) Draw the extensive form (game tree) for this one shot game. (6 points)

B) What is the sub-game perfect Nash equilibrium (spne) of this game if it is played once, there is complete information, and everyone is rational, and, why is this the most reasonable outcome of this game under these circumstances? (Two to four concise sentences.) (5 points)

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C) Now suppose Dan will have to hire a manager every year and there is some chance Dan is the kind of person who will always punish a shirking manager, no matter what. How likely must Amy think it is that Dan will punish her for shirking to induce her to work hard? Show your work. (4 points)

SUMMER 2006 EXAM 1

Name_____   UFID#_____

SHORT ANSWER 2 (10 Points)   *8. HOMOGENOUS PRODUCT MARKETS - Monopoly and Oligopoly*

Jennifer and Lindsay are the only two producers of widgets – a completely homogenous product, and engage in quantity competition. The inverse demand for widgets is given by $p = 20 - .5Q$. Lindsay's constant marginal cost is 5. Lindsay moves first. She knows Jennifer's reaction function is $q_J = 10 - .5q_L$.

A) Write Lindsay's profit function in the first period of the two stage game. (5 points)

B) Write the condition for maximizing Lindsay's profit. (3 points)

C) Solve for Lindsay's optimal quantity. Label your solution clearly. (2 points)

SUMMER 2006 EXAM 1

Name_____   UFID#_____

SHORT ANSWER 3 (15 points)   *9. DIFFERENTIATED PRODUCT MARKETS*

Ryan and Charles produce slightly differentiated gadgets. The demand for Ryan's gadgets is $q_R = 20 - .5p_R + .25p_C$. Ryan's unit cost is constant and equal to $2.

A) Write Ryan's profit function. (3 points)

B) Write the condition for maximizing Ryan's profits. (2 points)

C) Solve for Ryan's reaction function. (1 point)

D) Draw Ryan's reaction function and Charles' reaction function on the axes provided. (The reaction functions should have generally the right shape, they need not be to scale, and, you need no quantitative information about Charles' demand or cost for this problem.) Label each player's reaction function clearly. Label the equilibrium prices.
(4 points)

p_C

E) Suppose Charles invests in lowering his marginal cost of production. Show the effects of this investment in your figure. Label the new equilibrium prices clearly. (2 points)

F) Does Charles gain more or less from investing in cost reduction than a pure monopolist would at the same initial output and demand elasticity? Why? (One or two concise sentences only). (3 points)

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SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 1. COST MINIMIZATION (20 Points)*6. *More on Production and Cost**

A) Write down the two general conditions for minimizing the cost of producing 12 units of output (q) when the production function is $q(K,L)$ (where K is capital input and L is labor input) and input prices are w=20 and r=10 (w is the price of labor and r is the price of capital). Follow each condition with a very brief interpretation of the condition, or, an explanation of why it must be true to minimize cost. Use only the space provided.
(10 points)

Condition 1:

_____

_____

_____

_____

_____

Condition 2:

_____

_____

_____

_____

B. Suppose the production function is given by $q = 2K^{.5} + 4L^{.5}$ and the production target and input prices are as given in part A. Write down the cost minimization problem, including any necessary constraints. (5 points)

Minimize C(q)=

_____
     By choosing: _____and_____
Subject to the constraint(s):

_____

C. What values of K and L minimize the cost of producing 12 units? (Show your work). (5 points)

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 2. PERFECT COMPETITION. (28 Points)   *11. PERFECT
COMPETITION*
A perfectly competitive industry is composed of identical firms with marginal cost equal to $.1q$.
The minimum average cost is $5, and is attained when a firm produces 50 units.

A) If market demand is given by $Q = 10000 - 500p$ and there are 50 firms in the industry, what
are the short run equilibrium price (p) and industry output (Q), and, how much does each firm
produce (q)? (8 points)

B) In the long run, what is industry output (Q) and how many firms comprise the industry (n)?
(Assume the minimum average cost does not increase as total industry output increases.) (8
points)

C) Draw the long run industry supply curve in the figure below, labeled S_{LR}. Label the long run
equilibrium quantity for the initial demand calculated in part B. (5 points)

D) Show the effect of an increase in the price of a product that is a complement in consumption
on the industry equilibrium in the figure, labeling the new equilibrium quantity Q_2^e. (7 points)

p

Initial
Demand

Quantity
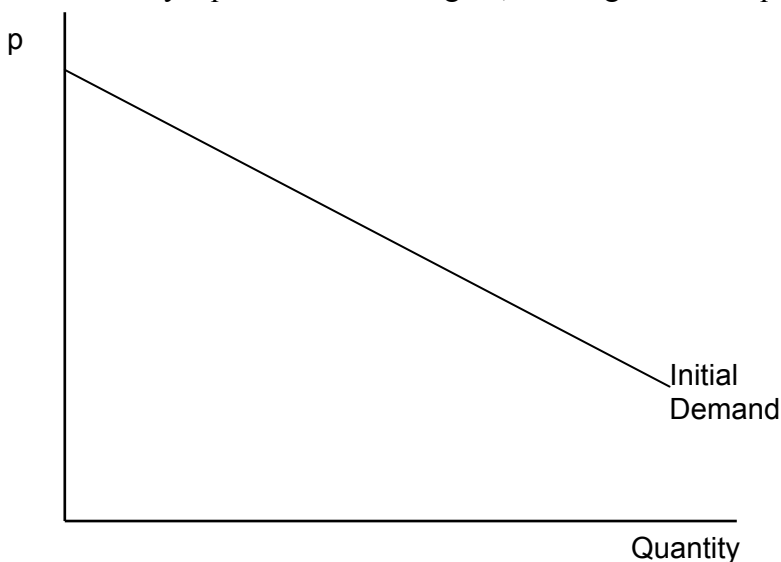
SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 3. MENU PRICING (32 points)   *15. Asymmetric Information, Menu Pricing, Procurement and Incentive Contracts*

A firm sells an identical product to two types of consumers with willingness to pay given by $V_1(q_1) = 10q_1 - .5q_1^2$ and $V_2(q_2) = 8q_2 - q_2^2$ respectively. There is one type 1 consumer and there are 2 type 2 consumers. The firm can not directly segment the market, but, can offer different size packages at differing prices (resale is not possible), tailoring a different package for each consumer type. The constant marginal cost of output is $2.

A) Write down the firm's profit maximization problem, including a numbered list of all constraints (including constraints that do not bind). Let q_1 and P_1 represent the size and price of the package intended for the single type one consumer. (So P_1 is not the price per unit, but rather the price of q_1 total units.) Similarly, P_2 and q2 represent the price and size of a package intended for each type 2 consumer. (6 points)

Maximize π

= _____

‾

   By choosing: ___, ___, ___ and ___

    Subject to: 1)_____

             2)_____

             3)_____

             4)_____

B) For each constraint in part A, write one sentence giving its meaning. Number the sentences to correspond to the numbers in the list of constraints in part A. (8 points)

1)_____

_____

2)_____

_____

3)_____

_____

4)_____

_____

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 3. MENU PRICING (Continued)

C) Write the number of each constraint that binds followed by a brief explanation of why it binds. (8 points)

___) _____

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D) Other than which constraints bind, is there any other useful fact that is always true about the quantity produced for either the large or small consumer type in this kind of problem? If so, briefly state it, and provide some intuition for why it is true. (5 points)

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E) What are the profit maximizing values of q_1, q_2, P_1, and P_2? Show your work. (5 points)

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 4-6. Conceptual Questions (20 points)

8. HOMOGENOUS PRODUCT MARKETS, 9. DIFFERENTIATED PRODUCT MARKETS, 11. PERFECT COMPETITION, & 10. PRICING AND STRATEGIES FOR SPECIAL SITUATIONS

4) In any industry with no significant barriers to entry, long run equilibrium is characterized by two types of conditions. Write them, along with a brief explanation of why they are satisfied in equilibrium. For purposes of this question, consider the general case in which firms are not necessarily identical. (10 points)

Condition 1: _____

_____

_____

Condition 2: _____

_____

_____

5) List three ways in which a firm may commit to an entry limiting quantity and price. (5 points)

1)_____

_____

2)_____

_____

3)_____

_____

6) Why is "commitment" important in entry limit pricing strategies? (5 points)

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FALL 2006 EXAM 1

SHORT ANSWER 1. (33 Points)   *7. GAME THEORY**   UFID#_____

Wendy is the incumbent provider of thingamabobs in Medium City, and, is considering improvements to her facility. Hana is considering opening a competing business. If Wendy improves her facility and Hana enters, Wendy's payoff is $40 and Hana's is -$10. If Wendy improves her facility and Hana does not enter, Wendy makes $60 and Hana makes $0. If Wendy does not improve her facility and Hana enters, Wendy's payoff is $20 and Hana's is $30. Finally, if Wendy does not improve her facility and Hana does not enter, Wendy's payoff is $80 and Hana's is $0.

A) Assuming Wendy and Hana move simultaneously, represent this game in normal form. Clearly circle and label the cells corresponding to any pure strategy Nash equilibra. If there are no pure strategy Nash equilibria, find the probability that Wendy improves her facility in the mixed strategy equilibrium. (14 points)

B) Now assume Wendy moves first. Draw the extensive form (game tree) for this one shot game. Clearly indicate the Nash equilibrium (equilibria) of this game. (14 points)

C) Would Wendy rather move first or second in this game? Briefly, explain why. (Write only what can fit in the space provided.) (5 points)

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FALL 2006 EXAM 1

SHORT ANSWER 2 (33 points) *8. HOMOGENOUS PRODCT MARKETS-Monopoly and Oligopoly*

Marianna and Lindsay are the only two producers of widgets – a completely homogenous product – and they and engage in simultaneous non-cooperative quantity competition (Cournot). The inverse demand for widgets is given by $p = 20 - .5Q$. Each player's constant marginal cost is 5.

A) Set up the players' profit functions and solve for the equilibrium quantity for each player. Make sure to keep your work neat and organized, so we can follow the flow in grading. If you need to use arrows to show the order of steps, do so. If you rely on any special simplifications that may be relevant in this case, be sure to point out what you are doing. (16 points)

B) Draw the players' reaction functions on the axes provided. Label the initial equilibrium quantities appropriately. (5 points)

C) Show the effect of a reduction in Marianna's marginal cost in the figure, labeling the new equilibrium quantities q_{M2} and q_{L2}. (You don't need specific numbers here, just show things moving in the appropriate direction.) (5 points)

q_m

q_L

D) Does Marianna gain more or less from this cost reduction than would a monopolist facing the same demand as the initial residual demand faced by Marianna? Very briefly, why? (7 points)

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FALL 2006 EXAM 1

SHORT ANSWER 3 (33 points)   *6. MOREON PRODUCTION AND COST, 11. PERFECT
COMPETITION & 12. APPLICATIONS OF SUPPLY AND DEMAND ANALYSIS*

A) ***MORE ON PRODUCTION AND COST*** Suppose the production function for gadgets is
given by $q = KL^2$, where L is labor input and K is capital input. Further, suppose the wage rate is
$10 and the cost of capital per unit is $20. Find the minimum cost of producing 8 widgits. (11
points)

B) ***COST MINIMIZATON*** Explain briefly, in words, what the 2 conditions that determine the
cost minimizing input combination for producing any given production target are, and, why they
must be satisfied to minimize cost. (11 points)

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C) ***PERFECT COMPETITION and APPLICATIONS OF SUPPLY AND DEMAND
ANALYSIS***
The graphs below represent a typical firm in a perfectly competitive industry in long run
equilibrium, and, the supply and demand curves in the industry. Draw the initial long run
industry supply curve, assuming firm level cost curves are not affected as the industry expands,
and label it LRS. Then, show the effect of a per unit tax of $2 (levied on firms) on the firm and
the industry in the long run, including showing shifts in all affected curves. (11 points)
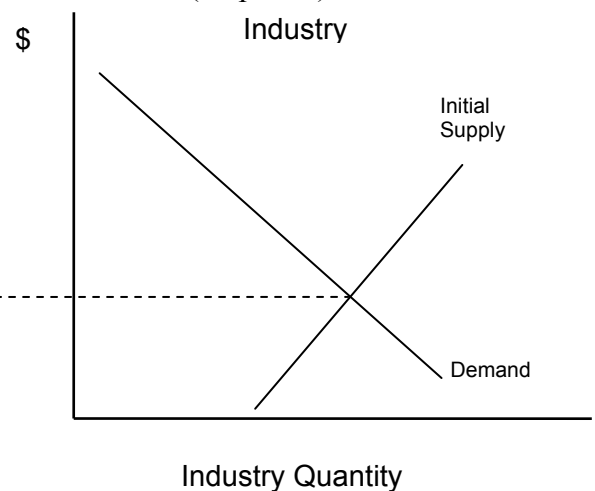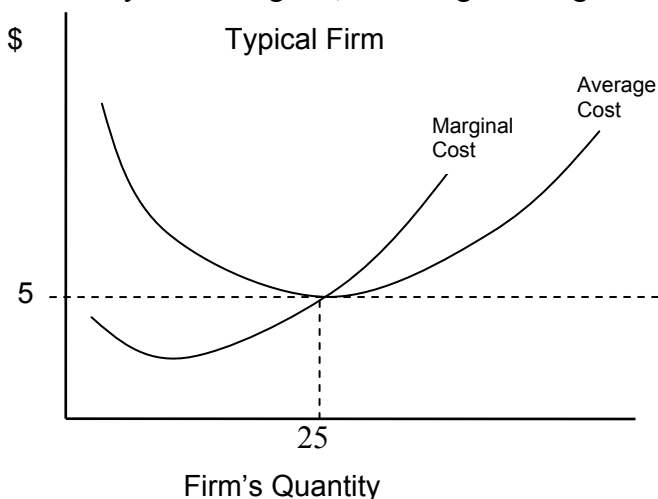
FALL 2006 EXAM 1
SHORT ANSWER 4 (33 points)   UFID#_____
Provide a very brief answer to 4 of the following 6 questions, using only the space provided.

A) **7. GAME THEORY** If there are 2 Nash Equilibria in a sequential game, one of which is subgame perfect, why is the subgame perfect one a more reasonable prediction of the outcome of the game? (8.25 points)

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_____

B) **8. HOMOGENOUS PRODUCT MARKETS** If there are no entry barriers, what are the 2 conditions that must be satisfied in order for a homogenous product industry in which firms engage in quantity competition to be in long run equilibrium? (8.25 points)

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C) **7. GAME THEORY** Why can't cooperation be sustained in games with a finite and known end period? (8.25 points)

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D) **7. GAME THEORY** Why is it more difficult to sustain cooperation when there are more players? (8.25 points)

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E) **7. GAME THEORY** Why might rational players carry through with threats or promises that would not be optimal in a one shot game if they will play a large, but finite and know, number of times and there are a small number of "crazy" players, at least from most players' points of view? (8.25 points)

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F) **7. GAME THEORY** What happens to the incentive for rational players to mimic the behavior of "crazy" players as they draw nearer the last period in which they will play a game? (8.25 points)

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FALL 2006 EXAM 2

1. SHORT ANSWER 1.   *3. Econometrics Part 1: Approximations-Regression-Using Imperfect Information*

Your firm must produce output before knowing final demand with certainty; you know only that it might be either a high demand period or a low demand period. In a high demand period, inverse demand is $p_H = 20 - .25q_H$ In a low demand period, inverse demand is $p_L = 16 - .25q_L$. If you produce

		Actual Demand	
		High	Low
Forecast	Good News	71	9
	Bad News	4	16

more than is sold, it is not economical to store output until next period. The constant marginal cost per unit is $1.5. You have paid for a forecast of demand for the past 100 periods, the results of which are summarized in the table to the right.

A) If a forecast is not purchased, find the profit maximizing quantity to sell if demand turns out to be high, the profit maximizing amount to sell if demand turns out to be low, and expected profit. (7 points)

B) Conditional on having received a forecast of low demand, find the profit maximizing quantity to sell if demand turns out to be high, the profit maximizing amount to sell if demand turns out to be low, and, expected profit. (7 points)

C) Let π_G stand for expected profit conditional on good news, π_B stand for expected profit conditional on bad news, and let π_N stand for expected profit if a forecast is not purchased. Using the probabilities given in the table above, write the expression for the value of a forecast. (Just use π_G, π_B, and π_N, not numbers.) (7 points)

D) Now, suppose there was a fixed cost of production that can be avoided if production is 0. Further, this fixed cost is higher than π_B (ignoring the fixed cost) and lower than π_N (ignoring the fixed cost). Would the forecast be more valuable, less valuable, or, of the same value as you found in part C? Why? (4 points)

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FALL 2006 EXAM 2

SHORT ANSWER 2.   *9. DIFFERENTIATED PRODUCT MARKETS*

A) Tina and Stacy engage sell slightly differentiated thingamajigs and engage in price competition. The initial demand for Tina's thingamajigs is given by $q_T = 10(1 + p_S - p_T)$ and the initial demand for Stacy's thingamajigs is given by $q_S = 10(1 + p_T - p_S)$. Both firm's face a constant per unit cost of production equal to \$2. Write out the firms' profit functions and solve for the equilibrium prices. (8 points)

B) Draw the firm's reaction functions on the axes provided. Label Tina's reaction function R$_{T0}$ and label Stacy's reaction function R$_{S0}$. Also, label the equilibrium price. (6 points)

C) Suppose an aggressive advertising campaign by Tina shifts the demand cures to $q_T = 10(1.25 + p_S - p_T)$ and $q_S = 10(.75 + p_T - p_S)$, respectively. Show the effect on the reaction functions in the figure (you don't need to solve for precise numbers, just show things moving in the right directions. Label Tina's new reaction function R$_{T1}$ and label Stacy's new reaction function R$_{S1}$. Label the new equilibrium prices p_{T1}^e and p_{S1}^e. (6 points)

p_T

p_S

D) Generally, with several firms in an industry, are the incentives for advertising higher with differentiated products price competition or homogenous product quantity competition? Why? (5 points)

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FALL 2006 EXAM 2
SHORT ANSWER 3.   *4. Individual Choice and Consumer Theory* UFID#_____

Alexie is now opening an operation in Small Town in addition to her operation in Big City. Suppose all potential managers for the Small Town operation have the same utility function as one another. Their utility depends upon consumption of housing (H), consumption of other goods and services (O), and an amenity which is specific to the city in which the manager lives (A), for example the presence of a beach. The amenity value (A) is higher in Big City than in Small Town, housing (H) costs $20,000 per unit in Small Town and $25,000 per unit in Big City, and other goods and services (O) cost $1 per unit in both Small Town and Big City. In Big City, managers earn $100,000. Assume the manager's only source of income is their salary.

The figure shows the indifference curve corresponding to the utility level the managers would get in Big City, $\bar{U}_B$, the budget line faced by the manager in Big City, and the optimal choice of H and O in Big City, 2 and 50,000. The indifference curve labeled $\bar{U}_S$ shows combinations of H and O in Small Town that would give the same utility level as the manager would get in Big City.

A) Draw the budget line faced by a manager earning $100,000 in Small Town in the figure. (I suggest using a pencil or a calculator as a straight edge.) With this income, they can buy more of both H and O in Small Town than in Big City. Is a salary of $100,000 more or less than required to get them to accept a position in Small Town? Why? (12 points)

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_____

B) Draw the budget line that would correspond to the salary just high enough to get the manager to be indifferent between working in Big City and working in Small Town. Label the optimal choice of H and O in Small Town at this salary H_S and O_S. (8 points)

C) Suppose the mangers' utility function is given by $U = \dfrac{HOA}{10000}$, and that A=1 in Small Town and A=1.8 (or, 9/5) in Big City. What is utility in Big City? Find the minimum salary needed to reach this level of utility in Small Town (indifference curve $\bar{U}_S$). (5 points)

FALL 2006 EXAM 2
SHORT ANSWER 4 (25 points)　*16. The Firm*　　　　　　UFID#_____

Having sold their gadget venture, Ray and Will have now come up with a new and improved way to produce widgets! Working together, the value they can create is given by $V = 20\sqrt{e_R} + 25\sqrt{e_W}$, where e stands for effort. The cost of effort, the amount you would have to pay Ray and Will to induce them to willingly put forth that much effort, is given by e_R for Ray and $2e_W$ for Will, respectively.

A) Write the expression for joint surplus to be maximized if Ray and Will cooperate efficiently (the equivalent of the profit function in this case), and, solve for the efficient level of effort for Ray. (6 points)

B) Assuming Ray and Will simply split the total value evenly and treat widgit production as a non-cooperative game, maximizing their individual surplus given the behavior they expect of the other, write the expression for Ray's individual surplus, and, solve for the level of effort he would choose to maximize it. (7 points)

C) How much net surplus does Ray's free riding cost the joint operation? (4 points)

D) Why might no one enforce a contract between team members intended to alleviate free riding, and, why can selling the rights to profits generated from the widget venture to a group of stockholders resolve that mitigate that enforcement issue? (8 points)

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FALL 2006 EXAM 2
SHORT ANSWER 5   UFID#_____
Answer each of the following.

A) How does insurance create real economic value when people are risk averse? (8 Points) **5. UNCERTAINTY WITH RISK ADVERSION**

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_____
_____
_____
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B) Why does adverse selection necessitate laws against insider trading in stock markets? (7 Points) **15. ASYMMETRIC INFORMATION, MENU PRICING, PROCURMENT AND INCENTIVE CONTRACTS**

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C) Of the articles that have been posted on the discussion board, which two gave you the most insight into the course material? If you don't remember the name of the article, you can just say something like "the one on *whatever*", where *whatever* describes the main subject of the article sufficiently for us to figure out which one you are referring to. In what way did it help with which course concept(s)? There is no definite right or wrong answer here, but, whatever you say needs to make economic sense. (5 points each)

i)_____
_____
_____
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ii)_____
_____
_____
_____
_____
_____

SPRING 2007 EXAM 1
Short Answer 1. Product Development in the Gadget Market.   *7. GAME THEORY*

A) Ali and Joel run the only two firms in the gadget industry. If Ali uses his firm's substantial R&D resources to introduce a vastly improved product and Joel does not change his product, Ali will make $200 and Joel will make $0. If Ali introduces the improved product line and Joel clones Ali's changes, Ali will make $100 and Joel will make $100. If neither make any changes, Ali will make $110 and Joel will make $60. If Ali does not make any improvements and Joel improves his product line on his own, Joel will make $40 while Ali will make $80. Draw the game tree and indicate the subgame perfect and the non-subgame perfect pure strategy Nash equilibria. (40%)

B) Suppose Ali will play games like this again and again, and that there are some "crazy" players who always punish competitors that clone improvements. They do so by selling goods below the cost of the firm that cloned those improvements, resulting in a loss of $100 for both firms. What is the smallest value of a reputation as a tough competitor that would lead Ali to punish Joel, if Ali is not "crazy"? How high must Joel believe the probability of being punished by Ali is in order to keep him from cloning? (15%)

C) What happens to the value that Ali would place on maintaining a reputation as a tough competitor as he approaches retirement, and, why? (10%)

_____
_____
_____

D) If there are no equilibria in which each player plays a particular strategy for certain, how do you find the Nash equilibrium? (15%)

_____
_____
_____

E) Of the three articles posted on the class discussion board pertaining to game theory, which do you think is most applicable to this situation, and, briefly, why? (You need not give the title, just what it was about and how it pertains to this question.) (20%)

_____
_____
_____

SPRING 2007 EXAM 1

2. Minimizing Cost at Simona's Thingamabobs and Thingamajigs.   *Topic 6. More on Production and Cost*

A) Suppose Simona uses labor (L) and materials (M) to produce thingamajigs. At current production levels MP_L=5 and MP_M=2. The wage rate is $10, and the price of materials is $3. What can be done to reduce the cost of producing the same output level? Use the optimization condition for constrained cost minimization problems to explain why that would work. (30%)

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B) Suppose Simona produces her thingamajigs in two plants, plant A and plant B. Cost in plant A is given by $C_A(q_A) = 100 + .1q_A^2$, where the $100 fixed cost is sunk. Marginal cost in plant B is constant at $10. There is no cost for starting up plant B. Since the marginal cost in plant A is $0 if nothing is produced there, small amounts of output are optimally produced in plant A. Above what level of output does it become optimal to open plant B? Show your work, as just a number means you'll receive little credit. Briefly, in words, why is that the right quantity at which to open plant B? Also, how would your answer differ if there was some fixed start-up cost that would be incurred just for opening up plant B? (35%)

Topic 16. THE FIRM

C) A by-product of thingamajig production can be used to reduce the cost of producing thingamabobs. Using the by-product in this way reduces the cost of disposing of waste generated by thingamajig production. Suppose the constant marginal cost of producing thingamajigs alone is $5 and the constant marginal cost of producing thingamabobs alone is $4. Suppose that every thingamajig produced can reduce the marginal cost of a thingamabob by $2, and every thingamabob produced can reduce the marginal cost of a thingamajig by $1. The inverse demand for Simona's thingamajigs is given by $p_J = 10 - 0.5q_J$ and the inverse demand for Simona's thingamabobs is given by $p_B = 8 - 0.5q_B$ What quantities of thingamajigs and thingamabobs will maximize profit if Simona produces the two goods jointly? Why does this differ from the quantities that would maximize profits if the goods were produced independently of one another? (35%)

SPRING 2007 EXAM 1

3) Demand Approximation, Pricing, and Advertising at Brittney's Theatre.
Topics 3. Econometrics Part 1: Approximations-Regression-Using Imperfect Information, 2. Demand, Cost, and Profit Maximization

A) At a price of $6, Brittney was able to sell 600 tickets per night. After raising price to $8, she sold only 400. Using a linear demand approximation, what is the slope of the demand curve (not the inverse demand curve)? Also, using a log-linear demand approximation, what is the elasticity of demand? [FYI: ln(2/3)=-0.405, ln(1/2)=-0.693, ln(2)=0.693, and ln(4/3)=0.288] (25%)

B) List 2 factors discussed in lecture that have great influence on the usefulness of a demand approximation for making decisions regarding production or pricing, and, explain why they matter. (25%)

1)_____

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2)_____

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C) Suppose Brittney is opening a theatre in a new town with a population of 80000. She has found that the fraction of the population in similar towns that purchase a ticket on Friday night can be approximated by $f = 0.1 - 0.01p$. The constant marginal cost of selling one more ticket is $2, and, the capacity of the new theatre is 2000 per night. What price maximizes profit on Friday night? (25%)

D) Suppose in her theatre in Medium City, given a current advertising expense of $100 per day, the profit maximizing price and quantity are $8 and 1500 tickets per night, respectively, and the marginal cost per ticket is $3. She hires a consultant to report on the effectiveness of her advertising expenditures. The consultant reports that a 1% increase in advertising would raise sales by 0.02%. Assuming the consultant's estimate is accurate, how should Brittney change her advertising budget, and, why? (You are not expected to offer a specific numeric answer here.) (25%)

SPRING 2007 EXAM 1

4) Quantity Competition in the Widgit Market. *8. HOMOGENOUS PRODUCT MARKETS & 7. GAME THEORY**

A) Marianna and Lindsay have been run out of business by two new lean competitors, Jeff and Dan. Dan's reaction function is $R_D(q_J) = 25 - 0.25q_J$, the market inverse demand is $p = 10 - 0.1Q$, and Jeff's cost is $C_J(q_J) = 0.025q_J^2$. Assuming quantities are simultaneously chosen, write Jeff's profit function, find his reaction function, and solve for each player's equilibrium quantity. (20%)

B) Now write Jeff's profit function and find each player's equilibrium quantity assuming Jeff chooses his quantity first. (20%)

C) Now suppose Jeff and Dan will play this game an indefinite number of times, but there is chance that each play will be the last. Cooperation may be sustained by grim trigger strategies if

$\left(\dfrac{1+r}{r+f} \right)\left(\pi_{coop} - \pi_{ne} \right) \geq \left(\pi_{cheat} - \pi_{ne} \right)$. What does each variable stand for? (20%)

r:_____

f:_____

π_{ne} :_____

π_{coop} :_____

π_{cheat} :_____

D) How did we arrive at this inequality? You do not need to fully derive it mathematically, but explain where it comes from. (20%)

E) In the context of the quantity competition problem above, how would you find π_{coop} and π_{cheat}? (20%)

SPRING 2007 EXAM 1   **5) More on Market Structure.**   *8. HOMOGENOUS PRODUCT MARKETS, 9. DIFFERENTIATED PRODUCT MARKETS, and 13. MARKET STRUCTURE*

A) On the axes below and to the left, draw reaction functions for two firms, A and B, engaging in quantity competition. Label the equilibrium quantities q_{A1} and q_{B1}. (15%)

B) On the axes below and to the right, draw reaction functions for two firms, A and B, engaging in price competition with differentiated products. Label the equilibrium prices p_{A1} and p_{B1}. (15%)

C) In the model used in class to introduce differentiated product price competition, the relative desirability of each firm's product, from the viewpoint of a consumer, depended on the customer's location and on transport cost per unit distance to the firm. What types of things would customer location and transport cost represent when product differentiation is not geographic? (15%)

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D) Assume firm B invests in a technology to lower marginal cost. Show the effect this would have on the equilibrium under each type of competition in the figures above. Label the new equilibrium quantities q_{A2} and q_{B2} and the new equilibrium prices p_{A2} and p_{B2}. (15%)

E) All else equal, are incentives for cost reduction higher with quantity competition or price competition? Why? Relate your discussion to the graphs above. (20%)

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_____
_____

F) Describe a problem with using concentration measures such as the 4-Firm Concentration Ratio or the HHI to measure market power. Also, describe a problem with using measured mark-up to measure market power. (20%)

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SPRING 2007 EXAM 1

6) Equilibrium in the Gadget Industry. **8. HOMOGENOUS PRODUCT MARKETS, 9. PERFECT COMPETITION, & 12. APPLICATIONS OF SUPPLY AND DEMAND ANALYSIS*

A) Currently, the typical firm in the gadget industry faces a firm level residual demand that can be closely approximated by $p = 4 - .1q$, and a long run cost function that is closely approximated by $C(q) = 5 + 0.25q^2$. Describe what will happen in this industry in the long run, assuming there are no barriers to entry. (Explain why!) (35%)

B) Assume now that each of the 25 firms in the gadget industry is a price taker and that market demand is given by $Q_D = 120 - 10p$. What is the short run equilibrium price? What will happen in the long run? Why? (35%)

C) The owners of the 25 gadget firms from part B convince Congress that the short run equilibrium price from part B is too low to be fair. As a result, the US government pledges to buy and store as many gadgets as necessary to raise the equilibrium price by $2. How much does this cost taxpayers? How much does it increase industry profits? How much does it reduce consumer surplus? Illustrate the effect on each group in a supply and demand diagram drawn on the axes below. What happens to the tax cost of this program in the long run, and, why? (30%)

$

Q

SPRING 2007 EXAM 2

1. Strategic Pricing. Answer each of the following in the space provided.
                    Topic 10 PRICING AND STRATEGIES FOR SPECIAL SITUATIONS

A) If an upstream monopoly and downstream monopoly, that had been unable to cooperate in price setting, merge and determine output and pricing to maximize total profits, what happens to the final price faced by consumers? Why?

B) Why is credible commitment crucial to engaging in entry limit pricing? List 2 ways to so commit.

2. Cost. 10%   *Topic 6. More on Production and Cost*
Simona had to build a new plant when plant A was wiped out in a Hurricane. Cost in plant C is given by $C_C(q_C) = 100 + .05q_C^2$, where the $100 fixed cost is a start up cost that can be avoided if the plant is not used. Marginal cost in plant B is still constant at $10, with no associated start up cost. At what (if any) output range is only plant B used? What about plant C? What about B and C together? Show your work, as just the final answer, even if correct, is little credit. Briefly, in words, why does the plant(s) in use change in this way with the total amount produced?

SPRING 2007 EXAM 2

3. Perfect Competition. *11. PERFECT COMPETITION & 12. APPLICATIONS OF SUPPLY and DEMAND ANAYLSIS**

A) There are 50 identical perfectly competitive firms in the widget industry with cost functions given by $C(q) = 10 + 0.5q^2$. This is both the short run and long run cost function. Demand is $Q_D = 400 - 30p$. What is the short run equilibrium price? What is the long run equilibrium price? How many firms will be in the industry in long run equilibrium? Show your work and explain!

B) Ranchers raising Blahbas face a minimum average cost of $5 per pound and minimum marginal cost of $2 per pound, and Blahba ranching is a perfectly competitive, constant cost, industry. Using the axes at right: i) draw the long run industry supply curve labeled LRIS, ii) label the long run equilibrium quantity Q_0, and iii) draw a short run supply curve through the long run equilibrium price and Q_0 and label it S_0. Suppose the government prevents more ranchers from entering and establishes a price floor of $6 by buying up any surplus at that price and dumping it in the ocean. Then: iv) label the new quantity purchased by consumers Q_{DF}, v) label the new quantity produced Q_{SF}, vi) indicate consumer surplus after the floor goes into effect by labeling the appropriate area CS_F and marking it with scattered x marks, and vii) indicate the cost of the program to tax payers by labeling the appropriate area T_F and marking it with scattered + marks.

$ ... Demand ... Q

SPRING 2007 EXAM 2

4. Econometrics. 12%   * *3. Econometrics Part 1: Approximations-Regression-Using Imperfect Information and 14. Econometrics and Bias: Omitted Variables/Endogeneity/ Corrections*** Medium Inc. regressed units sold monthly for 25 cities over 20 months on price, advertising, advertising squared, population (in thousands), and per capita income (in thousands). The results are shown in the table to the right.

Variable	Coefficient	Standard Error
Price (Dollars)	-100	200
Advertising (Dollars)	-10	20
Advertising Squared	0.01	.75
Population (1000s)	20	4
Per Capita Income (1000s)	10	2
Constant	2500	75
Observations		500
F(5,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		100

A) Suppose Medium Inc is planning to open a new store in a town with a population (in thousands) of 100 and per capita income of $30 (thousand). Price and monthly advertising expenditures will be set at $10 and $1,000, respectively. Evaluate the usefulness of these results if the purpose is to provide a prediction of demand to determine the size of the new outlet. Assume that a prediction that is almost always within 5% (more or less) of the actual outcome is accurate enough for Medium Inc's planning purpose. (As part of your answer, construct an approximate 95% confidence interval for quantity.)

B) Now evaluate the regression assuming its purpose is to generate parameter estimates to determine profit maximizing price and advertising. (As part of your answer, you should consider the t-statistics of the parameters.) Describe a possible source of omitted variables bias in the results. How might instrumental variables be used to mitigate the problem? What are some possible instruments? What is another way the bias could be addressed, and, why would it help?

SPRING 2007 EXAM 2

5. Procurement Contracts and the Value of Information with Adverse Selection
 *** Topic *15. ASYMMETRIC INFORMATION,MENU PRICING, PROCURMENT AND INCENTIVE CONTRACTS****

A) Mike needs to procure custom thingamabobs. The value of the thingamabobs to Mike, before subtracting expenditures on the contract, is given by $\ln(q)$. There is a 0.5 probability cost will be \$2 per unit and a 0.5 probability cost will be \$5 per unit. Mike is negotiating with David to produce the thingamabobs. David will learn the true cost before actually producing the thingamabobs. Let P_H and q_H stand for the contract payment and quantity intended if cost turns out to be high and let P_L and q_L stand for the contract payment and quantity if cost turns out to be low. Set up Mike's full optimization problem, including both participation constraints and both truth-telling constraints. Which of the four constraints bind, which do not, and, briefly, why? You don't need to solve the problem, but, if you did solve it, you would find q_H is below the value equating the direct marginal cost of production to the marginal benefit to Mike. Why is this generally true in this type of problem?

B) Mike can pay Jaime to undertake a study of the issues involved with production to narrow the range of uncertainty before negotiating the contract. Based on long familiarity with similar problems, Jamie tells Mike there is a 0.5 probability that the study will conclude that the probability of low cost is 0.8, and that otherwise her study will conclude the probability of low cost is only 0.2. How would the problem in part A change if Mike hires Jamie and her study returns good news? Letting π_{GN}, π_{BN}, and π_{NN} stand for expected profit if Mike hires Jamie and the study yields good news, if he hires her and the study yields bad news, and if he does not hire her, respectively, write an expression for the most Mike would be willing to pay for the study.

SPRING 2007 EXAM 2

******ATTENTION FALL 2009: We will not cover inventory and demand uncertainty in detail. PLEASE SKIP THIS QUESTION

6. Uncertain Demand and Inventory. 12%.
        Topic n/a.

When Jeff produces whatchamacallits for shipment, he does not know if demand will be high or low. All he knows is that the probability of high demand is 0.6. If Jeff produces more than is sold, he can store it until next period at a cost of $3 per unit. Inverse demand in a high demand period is $p_H = 80 - 0.4q_H$ and in a low demand period it is $p_L = 67 - 0.4q_L$. The constant marginal cost is $18. **A)** Write out the complete maximization problem and find the optimal quantity to produce. Show all work. **B)** Describe the important steps in solving this kind of problem if storing unsold output were not possible but disposal is free. Then explain how the possibility of economically saving unsold goods changes the solution.

SPRING 2007 EXAM 2

7. Consumer Theory.   *4. Individual Choice and Consumer Theory*

Big Inc. wants to transfer Diana from Steel, an inland industrial city, to Beach, a coastal city with miles of beautiful sandy beaches. Diana is making $100,000 in Steel. She spends $50,000 on 3.5 units of housing (H) and $50,000 on other stuff (O), obtaining the utility level corresponding to the indifference curve labeled $\bar{U}_{Steel}$ in the figure. Since Diana likes the beach, she could achieve the same utility level with less O and H in Beach at any point on the indifference curve labeled $\bar{U}_{Beach}$. The cost of housing in Beach is $20,000 per unit. The cost of other stuff in both Beach and Steel is $1 per unit.

A) Draw the budget line Diana would face in Beach at a Salary of $100,000, and label it BL$_1$. Then draw the budget line that would make Diana just as happy in Beach as she was in Steel, and label it BL$_{MIN}$. What salary level in Beach gets her to that utility level?

B) At the consumer's optimal bundle, where the budget line is just tangent to the highest possible indifference curve, the marginal rate of substitution (MRS$_{HO}$) equals the price ratio (p_H/p_O). Explain in words why a bundle that does not satisfy this condition is not the best choice. (You can use another version of the optimization condition if you prefer.)

SPRING 2007 EXAM 2

8. Expected Utility and Insurance.   *5. *UNCERTAINTY WITH RISK ADVERSION*

1000 identical individuals have preferences over monetary gambles represented by the expected value of the utility function $u = w^5$, where w is the individual's wealth. Suppose initial wealth is $100, but each individual faces a 20% chance of losing $75.

A) What is the expected value of the gamble in monetary terms?

B) What is the certainty equivalent of the gamble?

C) Assume: i) the individuals' risks are independent, ii) the insurance industry is perfectly competitive, and iii) the cost of administering a policy, including a fair return to the insurance company is $1. Then, what price would be charged for an insurance policy and what is the total economic value created by the insurance industry?

SPRING 2007 EXAM 2

9. Other Decision Making Topics Answer each of the following in the space provided.
*5. UNCERTAINTY WITH RISK ADVERSION****

A) (12) Suppose you are searching for the best deal on a new customized software program to manage production scheduling. You have found a deal that is reasonable, but not the best you think is out there. How do you decide whether or not to search again? Also, how does your decision as to whether or not to search again depend on whether or not the deal you have already found will be available after another search is made?

******ATTENTION FALL 2009: We are not covering part A. PLEASE SKIP Part A.**

B) (12) You are deciding whether or not to open a store in a new city. You can buy a consultant's report on the market's potential. If the report is favorable, the probability of success is much higher than if it is unfavorable. You know all the relevant probabilities. What are the 2 conditions to check first to determine if the value of buying the report is even greater than 0 before proceeding to calculate its value?

C) (14) What lesson can be drawn from the Allais and Ellsberg paradoxes? What about the fact that the endowment effect appears to disappear with experienced decision makers?

SPRING 2007 EXAM 2

10. Incentive Contracts and Firm Structure - Answer all of the following in the space provided.
 * 15. ASYMMETRIC INFORMATION,MENU PRICING, PROCURMENT AND INCENTIVE CONTRACTS, &
 16. THE FIRM*

A) (15) When designing incentive contracts to motivate effort in the presence of moral hazard, there is a trade off between risk and incentives. Why? List 2 things that can tip the balance at the optimum toward stronger incentives and more risk.

B) (16) Generally, how can relationship specific investment lead to inefficient product development?

C) (16) What is the root cause of free riding in team production situations?

D) (15, 16) When contracts that might alleviate hold-up or free riding are difficult to enforce through the legal system, how can selling shares to stockholders to serve as residual claimants and hiring a manager with a reputation as an honest arbiter of internal disputes (and an interest in maintaining it) reduce those problems?

Fall 2007 EXAM 1

Short Answer 1. Simple One Shot Games.   *7. GAME THEORY*

Suppose Tolu and John are the only producers of Thingamajigs, and their products are nearly identical. They each have access to a technological improvement, the introduction of which will introduce product differentiation. Due to the accident of the geographic locations of their operations, the improvement will work slightly better for John than for Tolu. If John implements the change and Tolu does not, the expected value of future profits is $11 for John and $6 for Tolu. If John does not implement the change and Tolu does, John's profit is $8 and Tolu's is $9. If neither implements the improvement, the expected value of profits is $10 each. If both do so, expected profits are $6 for John and $4 for Tolu.

A) Draw the normal form for this game assuming John and Tolu play this as a one shot simultaneous move game. What is (are) the Nash equilibrium (equilibria)? Draw the normal form for this game. (7 points)

B) Suppose instead that Tolu moves first. Now what is the sub-game perfect Nash equilibrium? (Draw the game tree.) (7 points)

C) How might Tolu cultivating a reputation as an aggressive competitor have similar effects on the outcome of the strategic interaction between Tolu and John in a simultaneous move game as when Tolu moves first? (6 points)

Fall 2007 EXAM 1

Short Answer 2. Demand Approximation.   *3. Econometrics Part 1: Approximations-Regression- Using Imperfect Information and a bit of topic 2. Demand, Cost, and Profit Maximization*

Diana operates a lunch buffet. At a price of $7, she averages 100 customers per day. When she runs a sale price of $5, 120 customers purchase over the same time period. The unit cost of serving a customer is constant at $3 and capacity is not limited.

A) What is the linear approximation of the demand curve? (5 points)

B) Using that linear approximation, what is the profit maximizing price? (5 points)

C) Within the context of the problem (as opposed to broader concerns) is there any specific reason to feel confident about, or, doubt about, the estimated profit maximizing price? Explain what the reason is and why it inspires doubt or confidence. (5 points)

D) How should the distinction between long run and short run demand bear on Diana's pricing decision? (5 points)

Fall 2007 EXAM 1

Short Answer 3. Cost Minimizing Production Process. *6. MORE ON PRODUCTION AND COST*

A. Write out and explain the meaning of one of the three versions of what was referred to as the "optimization condition" for constrained cost minimization. Then, use it to explain precisely how the cost minimizing production process changes in response to a decrease in the cost of capital if the two main inputs are capital and labor. (10 points)

B. Suppose output is produced using labor (L) and capital (K) according to the production function $q = 0.5LK^2$. The price of labor is $100, and, the price of capital is $50. What amounts of capital and labor minimize the cost of producing 125 units? (10 points)

Fall 2007 EXAM 1
We will not cover joint production in this detail this semester, SKIP THIS QUESTION.
Short Answer 4. Multi-Product Cost and Profit Maximization. *DEMAND AND PROFIT MAXIMIZATION and 4. COST*

Ashley produces widgets at a constant unit cost of $7. She could use a by product of widget production to produce mini-widgets at a cost of $2. Every mini-widget produced reduces the cost of widget production by $1 since Ashley does not have dispose of the byproduct. Ashley can not produce more mini-widgets than widgets. The inverse demand for Ashley's widgets is given by $p_w = 15 - 0.5q_w$ and the inverse demand for her mini-widgets is given by $p_m = 8 - 0.25q_m$. The (fixed) cost of adding the facilities needed to produce mini-widgets is $30.

A. If Ashley does not add mini-widget production, how many widgets maximize profit? (6 points)

B. If Ashley adds mini-widget production, how many widgets and mini-widgets should she produce to maximize profit? (10 points)

C. Should Ashley invest in the facilities to add mini-widget production? (4 points)

Fall 2007 EXAM 1

Short Answer 5. Homogenous Product Oligopoly.   *8. HOMOGENOUS PRODUCT MARKETS, 11. PERFECT COMPETITION, and 7. GAME THEORY*

Phillip and Lyna each acquired half of the dairy farms in the industry. The wholesale inverse demand for milk is given by $p = 10 - .002Q$. Phillip's cost is given by $C(q_P) = 1000 + q_P$. Lyna's cost structure is identical.

A) Assuming the two engage in simultaneous move quantity competition, what are the equilibrium market price and quantity? (9 points)

B) If Phillip and Lyna each produced only half of the monopoly quantity, each would produce 1,125 units and make a profit of $4,062.50. Suppose that discount rate is 12%. Suppose further that there is a 20% chance that the department of justice may break them up into hundreds of small perfectly competitive firms that make no economic profit after any given year. Assume monitoring costs and noise are negligible. Can trigger strategies sustain implicit collusion in which each firm produces half of the monopoly output? Using notation from lecture, the present value of "cheating" against a grim trigger is $\left(\dfrac{1+r}{r+f} \right) \pi_{coop}$ and the present value of "cooperating" against a grim trigger strategy is

$$\pi_{cheat} + \left(\dfrac{1+r}{r+f} \right) \pi_{ne} - \pi_{ne} \text{.(7 points)}$$

C) What (generally) would happen to the ability to sustain cooperation if there were more players, and, why? (4 points)

FALL 2007 EXAM 2:

1. Differentiated Product Price Competition vs Homogenous Product Quantity Competition.
  8. HOMOGENOUS PRODUCT MARKETS and 9. DIFFERENTIATED PRODUCT MARKETS

A) As in the related questions in the multiple choice section, Susana and Tina are the only producers of uWidgets. Assuming they engage in simultaneous move price competition, draw their reaction functions in the set of axes to the right. They need only have the right general position and slopes need only have the right sign.

B) Explain what a reaction function means in this context. Be sure to explain the sign (+/-) of the slope, and, why the reaction functions have that slope.

p_T

p_S

C) Susana is considering launching a new advertising campaign that will raise the level of demand she faces by attracting new customers and making existing ones less price sensitive. Describe in general how this would change the price for both Susana and Tina (you do not need to calculate these), assuming the demand for Tina's product remains the same. Show the effect in the figure above. What is wrong with the assumption that the demand for Tina's product remains the same?

D) How would the reaction functions differ if the product were identical and the two firms engaged in simultaneous move quantity competition? Why?

E) Why are incentives for cost reduction stronger with identical products than with differentiated products?

FALL 2007 EXAM 2:

2. Supply and Demand and Measuring Market Power   *12. APPLICATIONS OF SUPPLY AND DEMAND ANAYLSIS & 13. MARKET STRUCTURE WRAP UP*

Suppose the minimum long run marginal cost of a gallon of orange juice is $3 and the minimum long run average cost is $4. Suppose the Citrus industry is well approximated perfectly competition and long run constant cost.

A) Draw the long run industry supply curve in the figure at right.

B) Suppose Citrus producers successfully lobby the government for a subsidy of $1 per gallon on the grounds that foreign competition is unfair. (The government pays the firms $1 beyond the market price for every gallon sold.) i) Calculate the cost of the program to taxpayers. ii) Calculate the change in consumer surplus. iii) Calculate the deadweight loss. iv) Mark the area corresponding to deadweight loss created by the subsidy with x's. v) Explain what a deadweight loss is.

C) Suppose a number of Citrus producers merge, causing the Herfindahl-Hirshman index (HHI) calculated over all U.S. Citrus producers to rise precipitously, drawing the scrutiny of the department of justice. Give two sound reasons the HHI may be misleading in this case, overstating concentration. Also, describe a way of measuring market power that may be better than the HHI, and, potential flaws with this alternative method.

FALL 2007 EXAM 2:

3. Utility Maximization and Compensation **4. *Consumer Theory***

Chris has an offer on the table that will pay him $5000 per month after taxes upon graduation to work in Lakeland, where rent is $1 per square foot. In Lakeland, his utility as a function of the size of his apartment (H) and the amount of money that he spends upon everything else (E) can be modeled by the function $U(H,E) = 100 + 4H - 0.001H^2 + E$.

A) Write out an equation for and draw Chris' budget line.

E

5

4

3

2

1

  1   2   3   4   5   H (000s)
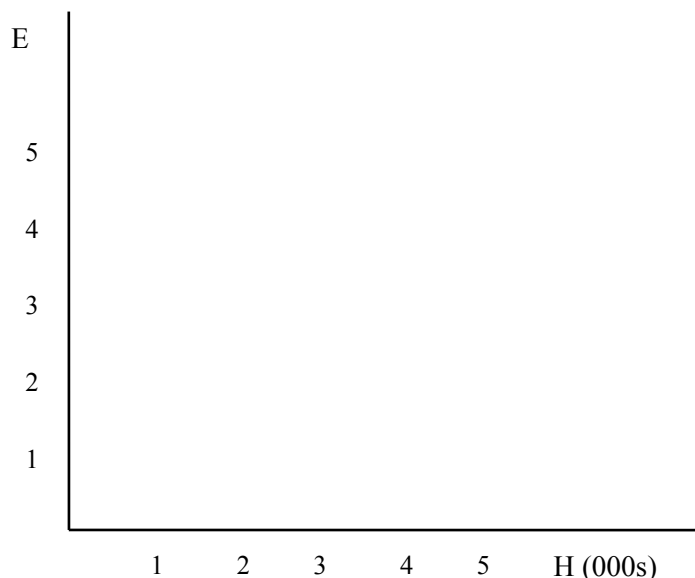
B) Find (calculate) Chris' optimal level of housing and expenditures on other stuff and indicate this point on your graph by drawing an indifference curve corresponding to where this optimum is achieved. The level of utility should come out to 7,350 with the optimal bundle.

C) Another company wants to entice Chris to move to Cincinnati. Chris finds the weather there less enjoyable, so, his utility is $U(H,E) = 4H - 0.001H^2 + E$ in Cincinnati (100 units less for any combination of H and E). Also, housing costs $2 per square foot in Cincinnati. Because of preferential tax treatment they receive from the city, the firm can offer Chris a 1400 square foot corporate owned apartment that would cost him $2,800 at an expense of only $2,700 to the firm. They are considering offering Chris a monthly salary of $3700 plus the free corporate housing, or, just offering him a salary of $6,400 per month, which costs them the same thing. Which would be more effective and why? (Because utility is higher or lower is NOT explanation of why. The question is, why one offer gives higher utility, when they cost the company the same thing.)

FALL 2007 EXAM 2:

4. Incentive Contracts and the Value of Information
  15. ASYMMETRIC INFORMATION, MENU PRICING, PROCURMENT AND INCENTIVE CONTRACTS

A) Michelle wants to hire Morgan to manage her new restaurant chain. Morgan's utility function is $u(w) - d(e)$ where w is her income and d(e) is the disutility of effort expended on the job (that is, the cost of effort in terms of utility). If Morgan works hard, the probability the new chain will succeed is 0.6 and the disutility of effort is 10. If she does not work hard, the probability the new chain will succeed is 0.2 and the disutility of effort is 0. At her current job, Morgan's utility is 50. Write out the participation and incentive constraints that Michelle must meet if she wants to hire Morgan and motivate her to work hard, assuming effort is not observable and success or failure is the only signal on which to base an incentive contract. Let w_H stand for salary if the restaurant is successful and w_L stand for salary if the restaurant is not successful. Explain in words what each constraint means.

B) Suppose Michelle is considering hiring Juan to conduct an analysis of the likelihood of success BEFORE hiring Morgan. Morgan and Michelle think that if Juan reports conditions are favorable, the probability of success if Morgan works hard is 0.8 and the probability of success if she does not work hard will still be only about 0.2. Compared to the case where Michelle does not commission Juan's report (part A), what would a finding of favorable conditions do to: 1) w_H, 2) w_L, and 3) the difference between expected compensation costs with the optimal incentive contract and compensation required to hire Morgan under certainty? Explain why.

C) Michelle thinks the probability that Juan will find favorable conditions if he undertakes the study is 0.7. Let E(w|F) be expected cost of Morgan's compensation given a favorable report. Let E(w|N) be expected cost of Morgan's compensation if Michelle does not commission the report. Suppose Michelle would not proceed with the restaurant if Juan reports unfavorable conditions. Success means a profit of $100 and failure means a loss of $50 (a negative profit), before Morgan's compensation is subtracted. Write out an expression for the value of Juan's report (you must factor in the expected cost of Morgan's compensation package).

FALL 2007 EXAM 2:

5. Insurance and Adverse Selection　　*5. UNCERTIANTY WITH RISK AVERSION and 15. ASYMMETRIC INFORMATION,MENU PRCING, PROCUREMENT AND INCENTIVE CONTRACTS*

A) 1,000 identical individuals with an initial wealth of $100 face a 0.2 probability that an accident will occur that reduces wealth by $75. All risks are independent. Each individual has a utility function given by $\sqrt{wealth}$.

i) If it costs $0.1 to write each policy, estimate the value created by insuring these 1,000 individuals. Show your work with everything clearly labeled.

ii) In words, how does insurance create value in this example?

B) Suppose Victor plans to make a take it or leave it contract offer to Emily, a public relations consultant, who he wants to hire to help smooth over hard feelings created by his choice of pricing strategy for his newly released uPhone. The value to Victor from improving his approval rating, A, is approximated by $V = 210A - 0.25A^2$. Emily's utility depends on her payment, P, and on how high she raises Victor's approval rating, and is given by $u = P^{0.5} - dA$, where d is the utility cost of raising the approval level one unit. If Amy stays in her current job, her utility will be 10. Victor does not know for sure how hard a task this will be, but, he knows there is a 0.4 probability that d equals 1 and a 0.6 probability d equals 4. Emily knows how hard the task will be, though. Victor wants to offer an optimal procurement contract that specifies a payment and approval level if the task is easy, (P_E, A_E), and, a payment and approval level if the task turns out to be hard, (P_H, A_H), so as to ensure Emily accepts the contract even if the task is hard but produces a higher approval rating if the task is easy.

Write the two binding constraints for Victor's optimization problem. Explain what each means and why each binds.

Set up Victor's optimization problem from Short Answer question 5B above and solve for the optimal levels of approval rating if the job is easy, A_E, and, if it is hard, A_H.

FALL 2007 EXAM 3

1. Free Riding   **UFID:**_____
       16. THE FIRM

Mari and Jon enter into a joint venture in which they design software to help students master Managerial Economics. They will split proceeds from sales of the software equally. If both work hard, total proceeds will be $188. If neither works hard, total proceeds will be $28. If one works hard and the other does not, total proceeds will be $100. Both Mari's and Jon's utility functions are given by $u(\pi,e) = \sqrt{50 + \pi} - d$, where π is the individual's share of proceeds and d is the cost of effort in utility terms, or, the disutility of effort. The disutility of working hard is 4, and the disutility of not working hard (free riding) is 1.

A) Analyze this situation as a one shot non-cooperative game. Draw the normal (strategic) form of the game and clearly identify the Nash equilibrium. Hint: the payoffs should be in utility, not money.

B) Suppose that there are opportunities to punish partners that free ride, for example by giving them bad recommendations. There is no immediate economic reward to delivering such punishments but there are costs of delivering them in terms of time and effort. Mari has played games like this many times. She has always worked hard and has always gone out of her way to punish partners that free ride on her efforts. Jon is not concerned about his reputation. Let f be the probability with which John thinks Mari will work hard, let g be the probability with which he thinks Mari will punish him if he free rides, and let c be the cost to him in lost utility if he is punished. Write an inequality that determines if Jon will free ride and very briefly explain what it means. Name one very crucial factor he should consider in evaluating whether Mari will live up to her reputation and briefly explain why it matters.

C) Briefly, what is the basic cause of free riding and why does it get worse with more partners?

E) Briefly, how can forming a firm with outsiders as shareholders reduce free riding?

FALL 2007 EXAM 3

2. Peak Load Pricing   **UFID:**_____

2. DEMAND, COST, AND PROFIT MAXIMIZATION

A) The inverse demand for evening shows at Eric's cinema is given by $p_E = 9 - 0.04q_E$ (demand is

$q_E = 225 - 25p_E$) and the inverse demand for matinee shows is given by $p_M = 9 - 0.05q_M$ (demand is

$q_M = 180 - 20p_M$). The cost of admitting one more customer to a showing with seating available is \$1.
The cost of adding additional space (marginal capacity cost) is \$2 per seat. Eric will charge a different
price for matinee shows than for evening shows. Set up Eric's profit maximization problem and solve for
the optimal capacity and also for the optimal prices for matinee and evening shows. Give a brief explain
(in words) of what you are doing.

B) Suppose that instead some customers view evening and matinee shows as substitutes, so that the
inverse demand for evening shows is given by $p_E = 8 - 0.04q_E + 0.2p_M$ and the inverse demand for

matinee shows is given by $p_M = 6 - .05q_M + 0.25p_E$. Set up Eric's profit function. You do not need to
solve for the optimal capacity or prices. But, explain briefly how this difference would impact the optimal
prices compared to the case when matinee and evening customers are completely distinct groups.

FALL 2007 EXAM 3

3. Econometrics
 *3. ECONOMETRICS PART 1:
APPROXIMATION-REGRESSION-USING
IMPERFECT INFORMATION AND
14.ECONOMETRICS AND BIAS: OMITTED
VARIABLES/ENDOGENEITY/ CORRECTIONS *

Andrew added beach umbrella rentals to his
business and opened stands at 19 other
locations. He regressed the number of rentals on
price, population in thousands in the nearest
nine city blocks (including tourists in hotel rooms), and, a dummy variable equal to 1 for weekend days
and 0 otherwise. His data cover nearby populations from 2 to 12 (thousand) and prices from $3 to $7 over
3 years. Results are given in the table.

Variable	Coef.	Std. Err.	t	p-value
Price (Dollars)	-4	8	-0.50	0.617
Population (1000s)	8	4	2.00	0.046
Weekend	2	8	0.25	0.803
Constant	28	4	7.00	0.000
Observations			1095	
F(3,1091)			2.371	
Probability > F			0.069	
Root Mean Square Error (RMSE)			25	

A) Suppose he plans to open a new stand with a nearby population of 5 (in thousands) and charge $5.
Write the equation for the demand curve and estimate weekend sales at the new location. Then, evaluate
the usefulness of the regression for predicting weekend sales to determine capacity needed at the new
location.

B) Evaluate the usefulness of the regression for generating estimates of demand curve parameters to be
used to determine profit maximizing prices. For now, ignore the possibility of omitted variables bias.

C) What is omitted variables bias, what are some likely sources of it in this example, and, how would it
affect the usefulness of the parameter estimates?

FALL 2007 EXAM 3

4. Market Structure, Supply and Demand   UFID:_____
 *8. HOMOGENOUS PRODUCT MARKETS, 11. PERFECT COMPETITION & 12. APPLICATIONS OF SUPPLY
AND DEMAND ANALYSIS*

A) There are 11 firms in a homogenous product industry engaging in simultaneous quantity competition.
Inverse demand is given by $p(Q) = 7 - 0.02Q$. In the Nash equilibrium, firms 1 thru 10 produce 25

units each. The 11th firm's cost function is given by $C(q) = 5 + q + .005q^2$. Write the 11th firm's profit
maximization problem. How much does the 11th firm produce? What is the short run equilibrium price?
What happens in the long run, and, why?

B) The figure below at left shows cost curves for a typical firm in a constant cost industry in which firms
behave as price takers. The figure below at right shows market demand and the initial short run supply
curve.
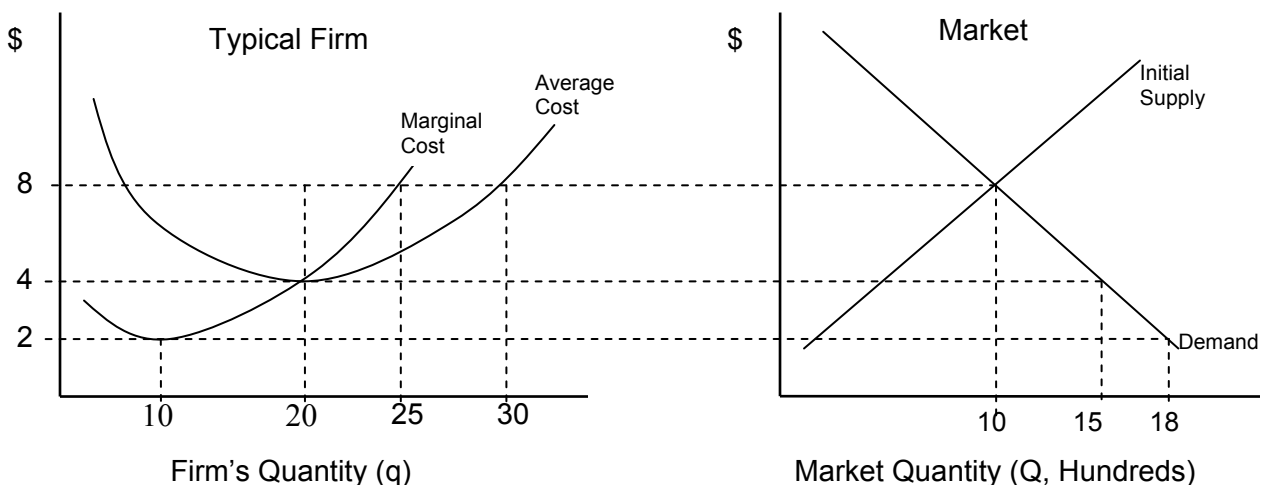
i) How many firms are initially in the industry?

ii) What is the long run equilibrium price?_____
iii) Draw the long run industry supply curve in the figure, labeled LRIS.
iv) How many firms comprise the industry in the long run?

v) Show the impact of a $2 per unit subsidy in the long run in the figure.
vi) Mark the area corresponding to the deadweight loss with x's.
vii) How much taxpayer money does it take to fund the subsidy?

SPRING 2008 EXAM 1

Question 1. Product Innovation in the Thingamajig Market   *Topic *7* GAME THEORY*

Kristen is the largest producer of thingamajigs. German has a small part of the market. Both are considering introducing a new technology. If neither introduces the new technology, Kristen will make $7 and German will make $2. If both do so, they will incur the costs of product development and will also be in more direct competition with each other. As a result, Kristen make $5 and German will make $0. If German introduces the new technology and Kristen does not, he will gain many customers that were loyal to Kristen. In that case, German will make $3 and Kristen will make $4. If Kristen introduces the new technology and German does not, Kristen will make $6 and German will make $1.

A. Suppose lead time and market conditions are such that neither Kristen nor German know what the other is going to do when they make their decisions. Set up the normal form of the game in the space to the right. Find the mixed strategy equilibrium. In your work, let k be the probability that Kristen innovates and let g be the probability that German innovates. (5 points)

B. Suppose German has the lead in development and conditions are such that he must make his decision before Kristen, and that Kristen will know his choice when she makes her decision. Write out the game tree for this game and clearly indicate the roll-back or backward induction solution. (5 points)

C. Suppose Kristen moves first. Write out the game tree and clearly indicate the backward induction solution. (5 points)

D. Now, suppose timing is such that either can choose to wait until after the other's move has been observed, but, if both wait until late in the market cycle, they move at the same time. Then, the timing of moves becomes part of the game too. Who moves first, and, why? (5 points)

Question 2. Repeated Games and Reputation Games   *Topic 7. GAME THEORY*

A. In a repeated game with no reputation effects, cooperation is possible if

$\left(\dfrac{1+r}{r+f}\right)\left(\pi_{cooperate} - \pi_{ne}\right) \geq \pi_{cheat} - \pi_{ne}$. Briefly describe how we arrived at this formula, what it means if the

inequality is satisfied, and, what is represented by i) $(1+r)/(r+f)$, ii) $\pi_{cooperate} - \pi_{ne}$, and iii) $\pi_{cheat} - \pi_{ne}$.
(7 points)

B. Why must a "reputation" be relatively expensive to earn and in order to be meaningful? (4 points)

SPRING 2008 EXAM 1

Question 3. Cost Minimization   *Topic 6 MORE ON PRODUCTION AND COST*

A. Write out a version of the optimization condition for cost minimization and explain why it must be satisfied by the cost minimizing input combination. (5 points)

B. Suppose Ed's firm develops a production process that allows producers to use more workers and less capital to produce any given output level than prevailing technologies. In what types of countries should Ed focus his marketing efforts? Explain why, making precise use of the optimization condition. (5 points)

SPRING 2008 EXAM 2

Question 1. Competition or Cannibalization in the Thingamajig Market
   9. Differentiated Products,

Seitz is the only provider of thingamajigs. His research suggests there is a significant niche for a new type. Let Seitz' current product be type 1 and the potential new product be type 2. The inverse demand for type 1 is $p_1 = 15 - 0.2q_1 - 0.1q_2$, where the subscript denotes type. Inverse demand for type 2 is $p_2 = 15 - 0.2q_2 - 0.1q_1$. Both types cost $3 per unit to produce. If no one produces type 2, Seitz maximizes profits selling 30 units per period at a price of $9, making a profit of $180. SHOW ALL WORK IF YOU WANT CREDIT!!!!

A) Assuming a competitor introduces type 2, write Seitz' profit function and find the Nash equilibrium quantities and prices. Verify that Seitz' profit will be $115.2. (*10 points*)

B) Assuming Seitz introduces type 2, write his profit function and find the quantities and prices that maximize profit. Verify that profit will be $240 (ignoring for now up front costs of development, etc…). (*10 points*)

C) The up front cost to introduce type 2 is $175. Seitz is the market leader, so he has the first chance to fill the niche. If he does so, this year and next year he will be the only provider of each type. It is known that the market for both types will dry up after next year. If Seitz does not introduce type 2, if another firm does so, they will do so this year . Let f represent Seitz' belief about the probability another firm will introduce type 2 if he does not. What value of f makes Seitz indifferent between cannibalizing part of his current market versus simply hoping no one else enters? For simplicity, ignore the time value of money (assume r=0). (*10 points*)

*** 1 Bonus Point: Why is the assumption that no other firm will introduces type 2 in the second year if it was not introduced in the first year really a logical conclusion, not an assumption?

SA   173   Questions

Question 2. Price Supports in the Blahblah Market   *Topic 12. APPLICATIONS OF SUPPLY AND DEMAND ANALYSIS*

The figure at right depicts supply and demand in the market for Blahblah meat. The long run industry supply curve is labeled LRIS and the short run supply curve at the initial long run equilibrium is labeled S_{SR}. The initial demand curve is D_1. Due to decreases in the prices of substitutes and reports that excess Blahblah consumption is unhealthy, demand falls to D_2. In response, Blahblah ranchers successfully lobby the federal government for a price support program to restore price to the original level (the equilibrium price BEFORE demand fell). The government keeps prices up by buying up as much Blahblah meat as necessary to support the price. SHOW ALL WORK IF YOU WANT CREDIT!!!!

A) Calculate the per-period values of:
The loss of consumer surplus in the short run due to the price support: _____
(*1 point*)

The loss of consumer surplus in the long run due to the price support: _____
(*1 point*)

The total cost (in tax dollars) to fund the price support: _____
(1 *points*)

B) Mark the area corresponding to the loss of consumer surplus in the long run using vertical lines (‖‖‖). (*2 points*)

C) Mark the area corresponding to total tax dollars to support the price using horizontal lines (≡). (*3 points*)
*** Areas may overlap for B and C

D) Absent the price support, why is the decline in price larger in the short run than in the long run? (Something like "Because of the slopes of the SR and LR supply curves" is not an answer. Rather, why do the curves have that relation to one another and why does that impact the price?) (*6 points*)

E) What is a deadweight loss? (Don't try to calculate one, just describe what it is in words.) (*6 points*)

*** 3 Bonus Points: Mark the area corresponding to the DWL in the figure with scattered small circles (°₀°). The DWL is not obvious in this case. Don't spend any time on it until you have finished everything else on the exam!

SPRING 2008 EXAM 3

Question 1: Demand Approximation and Econometrics *Topic 3 ECONOMETRICS PART 1: Approximations- Regression- Using Imperfect Information and Topic 14 ECONOMETRICS and Bias; Omitted Variables/ Endogeneity/Corrections*

A) David sells gadgets. His sales are disproportionately to retired Caucasian women, and, are disproportionately strong in summer months. He wants to estimate a log linear demand approximation. That is

$q = Ap^\eta$ or $\ln(q) = \ln(A) + \eta \ln(p)$ where η stands for the price elasticity of demand. At his normal price of $8 he sells 60 units per week. He runs a sale price of $4 and sells 240 units weekly. Based on these 2 data points, estimate the price elasticity of demand? (4 points)

Variable	Coef.	Std. Err.	t	p-value
ln(Price)	-4	1.25	-3.2	0.001
ln(Advertising)	-0.02	0.05	-0.4	0.689
ln(Population)	0.7	0.35	2	0.046
ln(Income)	0.6	0.75	0.8	0.424
Constant	-2	2	-1	0.317
Observations			2500	
F(5,2495)			28.8	
Probability > F			<0.000	
Root Mean Square Error (RMSE)			0.25	

Parts B, C, and D
David collected more data over 100 weeks at locations in 25 different cities. The data included units sold, price charged, population, average income, and weekly advertising expenditures. He regressed the natural log of units sold on natural logs of the other variables. Prices and advertising levels are set for each location by the local manager. The data cover prices from $4 to $8, advertising from $200 to $400, population from 50,000 to 1,000,000, and per capita income from $30,000 to $ 45,000. Results are in the table at right.

B) If marginal cost is $3, calculate the profit maximizing price for the estimated elasticity and for the upper and lower limits of an approximate 95% confidence interval for the price elasticity. (4 points)

C) Do the results seem sufficiently accurate to serve as a basis for estimating profit maximizing price and advertising levels? Why or why not? (Ignore for now arguments about omitted variables bias.) (6 points) *(I do not know:* O.*)*

D) What is omitted variables bias and how might it have affected this regression? (Part of your answer should make specific use of information provided in the question.) (5 points) *(I do not know:* O.*)*

SPRING 2008 EXAM 3

Question 2: Demand Uncertainty and the Value of Information *Topic 3. Econometrics Part 1: Approximations-Regression- Using imperfect Information*

Your firm must produce output before knowing final demand. You know only that it might be either a high demand period or a low demand period. In a high demand period, inverse demand is $p_H = 18 - 0.25q_H$ In a low demand period, inverse demand is $p_L = 12 - 0.25q_L$. If you produce more than is sold, it is not economical to store output. The constant marginal cost per unit is $4. You have paid for a forecast of demand for the past 20 periods. Of those, 8 times the forecast was for high demand and demand was high, 2 times the forecast was for high demand but demand was low, 4 times the forecast was for low demand, but, demand was high, and, 6 times the forecast was for low demand and demand was low.

A) Estimate each of the following based the experience of the past 20 periods. (1 point each)

The probability of high demand, Pr(H):_____

The probability a forecast of high demand, Pr(GN):_____

The probability of high demand given high demand is forecast, Pr(H|GN):_____

The probability of high demand given low demand is forecast, Pr(H|BN):_____

B) Conditional on a forecast of low demand (bad news), find the profit maximizing quantity to plan to sell if demand turns out to be high and the profit maximizing amount to plan to sell if demand turns out to be low. (7 points)

C) Let π_G stand for expected profit conditional on good news, π_B stand for expected profit conditional on bad news, and let π_N stand for expected profit if a forecast is not purchased. Using the probabilities given above, write the expression for the value of a forecast. (Just use π_G, π_B, and π_N, not numbers.) (4 points)

D) Holding Pr(H) ,Pr(GN) and Pr(H|GN) constant, is the value of a forecast higher or lower if Pr(H|BN) is lower, and, why? (4 points) *(I do not know: O.)*

Question 3: Consumer Theory
Topic 4. INDIVIDUAL CHOICE – THE THEORY BEHIND DEMAND and Topic 5. UNCERTAINTY WITH RISK AVERSION

Anthony spends $12 on pizza and beer. Initially the price of pizza is $2 per slice and the price of a bottle of beer is $4, and he buys 2 of each. The initial budget line and consumption point (a) are depicted in the figure at right. Now, suppose the price of beer falls to $2 per bottle and the price of pizza increases to $4 per slice.
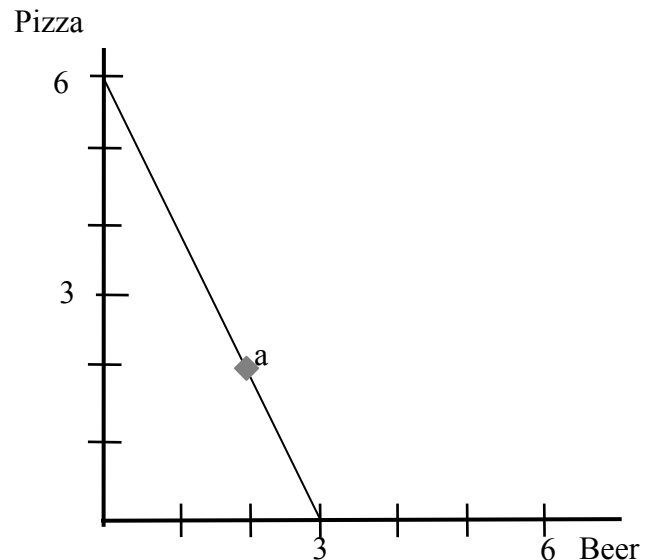
A) Draw the new budget line in the figure. (2 points)

B) Draw the original indifference curve (one that was just tangent to the original budget line) in the figure. (2 points)

C) Use what we called the "optimization condition" in class (either version) to explain why point a is or is not the optimal consumption bundle after the price change. (4 points) *(I do not know:* O.*)*

D) Is Anthony better off, worse off, or, just the same after the price change, and, why? (5 points) *(I do not know:* O.*)*

E) Briefly describe two of the following: i) the endowment effect, ii) the Ellsberg Paradox, or iii) the Allais Paradox. Your description need not have any mathematical detail. (6 points) *(I do not know:* O.*)*

SPRING 2008 EXAM 3

Question 4: Expected Utility and Insurance   *Topic 5. UNCERTAINTY WITH RISK AVERSION*

A) Suppose Dugan's utility function is $u = 1 - \dfrac{1}{w}$. His initial wealth is $100, but, there is a 0.1 probability that he will suffer a loss of $90. Find the certainty equivalent of Dugan's gamble. (6 points)

B) If there are 100 individuals facing the same gamble as Dugan (all are independent gambles) and administrative costs are $5 per policy, what is value added if everyone is fully insured? (5 points)

C) How does risk pooling pertain to the value of insurance, and, what does that mean for the number of policies a homeowner's insurance company writes in one geographic area? (6 points) *(I do not know:* O.*)*

SPRING 2008 EXAM 3

Question 5: Contracting with Moral Hazard   *15. ASYMMETRIC INFORMATION, MENU PRICING, INCENTIVE AND PROCUREMENT CONTRACTS*

The setup is as follows:
 a) Mari wants to hire Jon to serve as her CFO.
 b) If Jon works hard, the probability of high profit is 0.8. If he does not, it is 0.3
 c) Jon's utility is $\sqrt{w} - d$, where w is Jon's payment and d is the utility cost of Jon's effort.
 d) If Jon's effort is high, the disutility is $d_H = 3$, otherwise it is $d_L = 0$.
 e) Mari wants to offer an optimal incentive contract that specifies a wage if profit is high, w_H, and, a wage if profit is low, w_L.
 f) Jon's next best job offer has $w = 625$ and $d = 0$.
 g)

A) Write the participation and incentive constraints. (5 points)

B) Solve for w_H, and, w_L. (3 points)

C) What does it mean to say there is a trade off between incentives and insurance in designing incentive contracts? (6 points) *(I do not know: O.)*

D) What happens to the power of the incentives in such a contract (w_H - w_L) if the disutility of effort is higher? (4 points) Why, in words? *(I do not know: O.)*

SPRING 2008 EXAM 3

Question 6: Contracting with Adverse *Selection* *15. ASYMMETRIC INFORMATION, MENU PRICING, INCENTIVE AND PROCUREMENT CONTRACTS*

The setup is as follows:
  a) Ajay wants to hire Marti to improve customer satisfaction, *S*.
  b) Ajay will make a single take it or leave it contract offer.
  c) The total value of *S* to Ajay is *10S*, (or 10 per unit).
  d) Marti's utility is $\sqrt{P} - dS$, where *P* is Marti's payment and *d* is the utility cost of "producing" *S*.
  e) Both parties know there is a 0.25 probability the job will turn out to be "hard" (H), otherwise it is "easy" (E).
  f) If the job is hard, the disutility to Marti is $d_H = 0.1$, otherwise it is $d_E = 0.05$.
  g) Ajay wants to offer an optimal procurement contract that specifies a payment and satisfaction level if the task is easy, (P_E, S_E), and, a payment and satisfaction level if the task turns out to be hard, (P_H, S_H).
  h) Marti will only sign the contract if her expected utility is higher than her reservation utility, which is 12, but, there are no liquidity constraints. So, there is only a single participation constraint in this problem.

A) Write out the single participation constraint. (3 points)

B) Write out the binding selection constraint. (3 points)

C) Explain the meaning of the binding selection constraint. (5 points) *(I do not know:* O*.)*

D) Explain why the non-binding selection constraint does not bind. (5 points) *(I do not know:* O*.)*

SPRING 2008 EXAM 3

Question 7: Duopoly and Collusion *Topics 8. HOMOGENOUS PRODUCT MARKETS & 7. GAME THEORY*

Mari and Lindsay are the only two providers of a homogenous product. Market inverse demand is $p = 20 - Q$. Each firm's constant marginal cost is \$2.If the two collude and act like a monopoly, each produces 4.5 units and makes \$40.5 in profit. If they engage in Cournot competition, each produces 6 units and makes \$36.

A) If the probability the game ends after any period is 0.2 and the interest rate is 0.1, is cooperation sustainable as a Nash equilibrium? (8 points)

B) Why does collusion become harder with more players? (4 points) *(I do not know: O.)*

C) What happens in this market in the long run, and, why? (4 points) *(I do not know: O.)*

SPRING 2008 EXAM 3

Question 8: Supply and Demand *12. APPLICATIONS OF SUPPLY AND DEMAND ANALYSIS*

The figure at right depicts long run supply and demand in the market for Blahblah meat. Suppose the government levies a tax of $2 per unit on Blahblah meat.
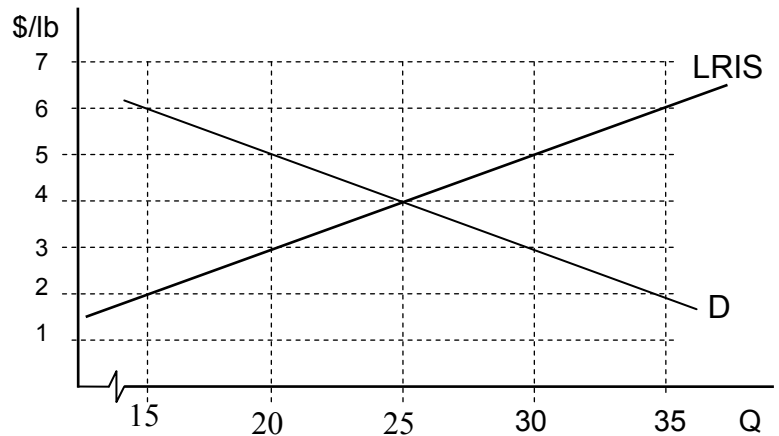
A) Show the after tax supply curve in the figure. (3 points)

B) What is the after tax price paid by consumers? _____ (1 point)

C) What is the after tax equilibrium quantity?

_____ (1 point)

D) How much consumer surplus is lost? _____ (2 points)

E) How much producer surplus is lost? _____ (2 points)

F) How much tax revenue is raised? _____ Mark the area in the figure with X's. (2points)

G) What is the deadweight loss? _____ Mark the area in the figure with O's (2 points)

H) What is the social cost per dollar of tax revenue raised by taxing Blahblah producers? What does this mean for benefit-cost analyses of government expenditures? (5 points) *(I do not know:* O.

Fall 2008 EXAM 1 - Question 1

7. GAME THEORY

1A	**Defense**	
	Run	*Pass*
Gator Offense *Run*	G: 0.6 D: 0.4	G: 0.8 D: 0.2
Gator Offense *Pass*	G: 0.7 D: 0.3	G: 0.6 D: 0.4

1A. Suppose the Gator football team faces 3rd and goal on the 4 yard line. They can line up initially with either a *Run* or *Pass* oriented offense. While they can make adjustments, the initial orientation influences their chance of success. Similarly, the defense can line up initially with either a run or pass orientation. Choices are simultaneous. The table at right represents this one shot game. The probability the Gators score is their payoff, and, the probability they do not score is the defense's payoff. (If you don't know much about college football, just treat it like any normal form game where the strategies are called Run and Pass).

Question: Find the probability the Gators choose a run orientation, g_R, and the probability the defense chooses a run orientation, d_R, in the mixed strategy Nash equilibrium. (8 points)

1B	**Defense**	
	Run	*Pass*
Gator Offense *Run*	G: 0.6 D: 0.4	G: 0.8 D: 0.2
Gator Offense *Pass*	G: 0.6 D: 0.4	G: 0.4 D: 0.6

1B. The next week the Gators play an opponent whose *Run* defense is as effective against the *Pass* as it is against the *Run* in short yardage situations (game at right). On College Game Day, Kirk Herbstreit and Lee Corso offer the following analyses.

Herbstreit: Since the run defense is better against the pass, the Gators should *Run* more in short yardage situations than last week.

Corso: The Gators want to get their run matched against the defense in pass orientation - they score 8 of 10 times that happens. Since the run defense is relatively better against the pass this week, the Gators should *Pass* more in short yardage situations to get the defense to shift to a pass orientation sometimes, then, take advantage of that once in a while.

Question: Which analyst is right, and, why? (6 points)

FALL 2008 EXAM 1 - Question 2

8. HOMOGENOUS PRODUCT MARKETS and 7. GAME THEORY

2. Armando and Gayle produce identical products and compete in quantities. Inverse demand is given by $p = 6 - 0.2Q$ and each firm's cost function is $C(q) = 0.1q^2$.

A. Set up Armando's profit function, find his reaction function, and, find the Nash equilibrium quantities and price. (8 points)

B. Graph and label the reaction functions on the axes to the right (They need only have the right general shape). Label the Nash equilibrium quantities q_{A1} and q_{G1}. (2 points)

C. Suppose Armando adopts a new technology that reduces his marginal cost. Show the change in the figure. (No calculations, just the general effect.) Label the new Nash equilibrium quantities q_{A2} and q_{G2}. (2 points)

q_G

q_A

D. How would you determine the value of the marginal cost reduction? (The most Armando would pay to achieve it.) (2 points)
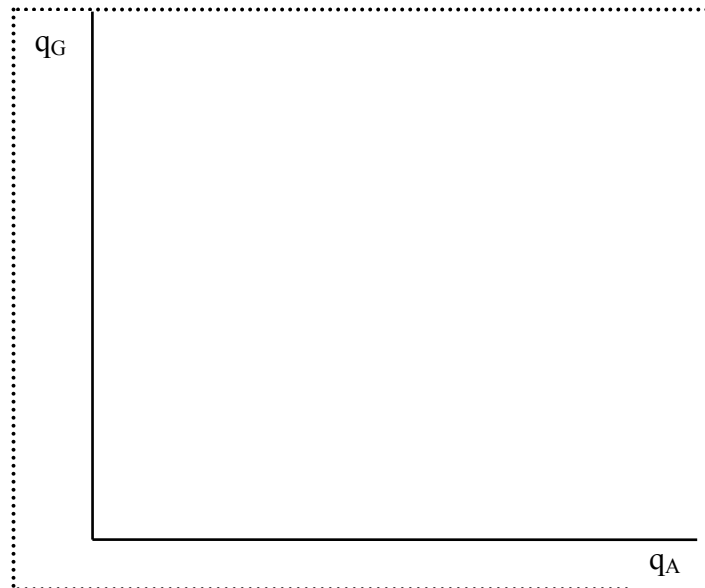
E. How is a unilateral reduction in marginal cost strategically similar to moving first? (4 points)

F. Is this cost reduction worth more or less to Armando than it would be to a monopolist facing the same initial marginal revenue curve, and, why? (4 points)

*9. DIFFERENTIATED PRODUCT MARKETS

1. Alina is currently a local monopolist. Brittaney is considering entering the market next year and producing a slightly differentiated product. Lead times and capacity limitations are significant, so, the firms would engage in simultaneous quantity competition. If Brittaney entered, the inverse demand for Alina's product would be $p_A = 6 - 0.2q_A - 0.1q_B$ and the inverse demand for Brittaney's product would be $p_B = 6 - 0.2q_B - 0.1q_A$. Both firms face a constant per unit cost of $2 and fixed costs of $10.

A. Set up Brittaney's profit function and find the price of her product in the Nash equilibrium.

*10. PRICING STRATEGIES FOR SPECIAL SITUATIONS

B. Suppose Alina is able to convince the county government to charge all firms in her industry a fixed fee each period to go toward workforce development and downtown redevelopment, which would go into effect one period before Brittaney entered. i) How might this keep Brittaney out? ii) How would Alina decide it that strategy was worthwhile? iii) How large would the fee need to be to keep Brittaney out? (Explain i and ii in words and calculate iii.)

*10. PRICING STRATEGIES FOR SPECIAL SITUATIONS

C. If instead Alina considered engaging in entry limit pricing, what would she have to do to make that strategy effective, how might she go about doing it, and, how would she decide if it was worth it? Explain generally in words, no calculations.

* 2. DEMAND, COST, AND PROFIT MAXIMIZATION*
2. Jimmy is opening a new restaurant, and, must decide on his capacity level. Capacity costs $2 per unit and he faces an inverse demand of $p = 12 - 0.5q$. The problem is, he does not know what operating cost is going to be, only that it will be constant at either $2 or $4 per unit.

A. Assume Jimmy only knows there is a 0.4 probability that operating cost will be $2 per unit and that otherwise it will be $4 per unit. Carefully set up the problem for finding Jimmy's optimal capacity and then find it. Let q_L represent production when operating cost per unit is low and let q_H represent production when operating cost per unit is high. (Be careful, H means high cost, NOT high production!)

* Topic 3 ECONOMETRICS PART 1: Approximations- Regression- Using Imperfect Information*
B. Now assume Jimmy can hire Chris to prepare a report on the likely operating cost before choosing capacity. Chris tells him there is a 0.4 probability the report will at the report will find a 0.8 probability that operating cost will be cost $2, and that otherwise the report will find a 0.2 , probability that operating cost will be $2. Assume Jimmy agrees with Chris' judgments about the probable content of the report. Write an expression for the most he should willingly pay for the report. Rather than working out profit in all scenarios, just let π_G represent expected profit if Chris reports a high probability that cost will be low, π_B represent expected profit if Chris reports a low probability of low cost, and π_N represent expected profit if Jimmy does not hire Chris.

* 2. DEMAND, COST, AND PROFIT MAXIMIZATION*
*C. Suppose that Jimmy has the option to put in place some capacity now and then to add additional capacity after learning the true operating cost. Later additions to capacity will cost $3 per unit, rather than $2. i) How would this change his decision about how much capacity to build today, and why? ii) What would this new option do to the value of Chris' report, and, why? No math required for i or ii, but be logical and concise in your explanation.

FALL 2008 EXAM 3 - Question 1
Topic 3 ECONOMETRICS PART 1: Approximations-Regression- Using Imperfect Information and Topic 14 ECONOMETRICS and Bias; Omitted Variables/ Endogeneity/Corrections

Variable	Coefficient	Standard Error
Price (Dollars)	-150	100
Population (1000s)	10	15
Per Capita Income (1000s)	-20	25
Constant	1500	75
Observations		5000
F(4,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		200

The gadget industry is approximately a constant cost perfectly competitive industry where the minimum long run average cost varies across cities. The Federal government is considering imposing a per unit tax of $4 on gadget producers. The gadget trade association hired your firm to quantify the economic effects of the tax. You gathered 5000 monthly observations on quantity transacted, price, population, and per capita income spanning 50 cities over 100 months (50X100=5000). Using that data, you used ordinary least squares regression to estimate demand, producing the results given in the table.

A) Taking the results at face value, estimate the equilibrium quantity before and after the tax is imposed and the deadweight loss from the tax in a city where the minimum LRAC is $8, per capita income is $30 (thousand), and population is 200 (thousand). Draw supply and demand on the axes provided. Label the before and after tax quantities and prices and the deadweight loss. Your drawing need not be strictly to scale.

B) What is the approximate lower limit of a 95% confidence interval for the price coefficient (the largest absolute value of the coefficient)? Using that, what is the upper limit of a 95% confidence interval for the deadweight loss?

C) Ignoring for now the possibility of omitted variables bias (OVB) or simultaneous equations bias, evaluate the estimated coefficient on income using criteria considered in class.

D) When does OVB occur, why does it create a problem for estimating causation, and what (specifically) could cause it in this case?

E) In what circumstances would exploiting the panel nature of the data by including city dummy variables (fixed effects) reduce worries about OVB? In what circumstances would it not do so?

F) Briefly describe (don't just list) 2 other ways to reduce OVB.

G) (You can earn points for getting this part right, but, will not lose many if you do not.) If $Q_D = a + bP + \varepsilon_D$ and $Q_S = c + dP + \varepsilon_S$ where a, b, c, and d are parameters to estimate and ε_D and ε_S are random error terms, demonstrate algebraically why simultaneous equations bias makes it impossible to estimate the slope of the demand curve with an ordinary least squares regression of Q on P (show that P is correlated with ε_D).

FALL 2008 – EXAM 3 - Question 2
Topic 15 ASYMMETRIC INFORMATION, MENU PRICING, INCENTIVE AND PROCUREMENT CONTRACTS

You must contract with a custom manufacturer to procure widgets to your exact specifications. Once procured, the value you place on the widgets is $V(q) = 10q - 0.05q^2$. The cost of producing these gadgets will be either low, $C_L = 100 + 2q_L$, or high, $C_H = 400 + 4q_H$. No one is sure what the cost of the widgets will turn out to be, only that the probability of low cost is f.

You can make a take it or leave it contract offer consisting of a quantity to deliver and a total payment if cost is low (q_L, P_L) and a quantity to deliver and a total payment if cost is high (q_H, P_H). The manufacturer will learn the true cost before actually producing, but, not before the contract is signed, and, you will never observe the true cost, only the manufactures choice. Unlike the example from class, however, assume you can hold the manufacturer to the contract in all circumstances, even if they would take a loss. Therefore, while the manufacturer's *EXPECTED* profit must be at least 0 for them to participate, it need not be at least 0 for both high and low cost separately.

A) Write your expected profit as a function of q_L, P_L, q_H, and P_H (don't write the constraints yet).

B) Write out the participation constraint (there is only 1 for this problem).

C) Write out the *binding* selection constraint for this contracting problem.

D) Solve for the values of q_H and q_L assuming f=0.25

E) Explain i) what the binding selection constraint means, and, ii) why this selection constraint binds and the other one (that you were not asked to write) does not.

F) You hire Marianna to gather additional information on the chances the cost of your gadgets will be low before the contract is offered. Suppose Marianna reports good news (a higher chance of low cost). What would happen to the profit maximizing values of i) q_L, ii) q_H, iii) P_H, and iv) P_L? For each one, *concisely explain why!!!* (Hint: There is a reason you should discuss them in the order given, and, the space provided for answers roughly corresponds to the length of the right answers.)

G) Suppose the chance of high cost was so small based on Marianna's research that solving the problem above led to a solution for q_H that was less than 0. Then, you would need to recast the problem and solve it again. How much profit would the manufacturer make if cost was low in this case, and why?

H) How would you decide whether or not to hire Marianna? How does that decision hinge on how much your probability assessments will change with what she reports, and why?

Fall 2008 EXAM 3 - Question 1 Answer Sheet

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B)

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C)_____

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D)_____

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Fall 2008 – EXAM 3 - Question 2 Answer Sheet

A)

B)

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D)

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F_i)_____

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F_ii)_____

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F_iii)_____

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F_iv)_____

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G)_____

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H)_____

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SPRING 2009 EXAM 1 SHORT ANSWER 1

*Topic 3: Econometrics Part 1: Approximations/Regression/Using Imperfect Information

Suppose you have weekly data on quantity sold (q), price charged in dollars per unit (p), per capita income in thousands (m), and population in thousands (N) for 200 weeks over 3 cities, A, B, and C. Table 1 gives summary data for q/N, N, p, and m for each city.

	Table 1: Summary Statistics for Sales Data Set											
	q/N			**N**			**p**			**m**		
City	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
A	0.25	0.15	0.35	25	24	26	40	30	45	32	30	34
B	0.2	0.1	0.4	55	52	56	42	32	50	26	25	28
C	0.1	0.05	0.2	102	99	108	60	54	70	41	39	42

You run a linear regression of quantity per thousand residents (q/N) on p and m, yielding the results shown in table 2.

Table 2: Regression Results		
Variable	**Coefficient**	**Standard Error**
Price (Dollars)	-0.01	0.004
Per Capita Income (1000s)	0.005	0.002
Constant	0.49	0.15
Observations		300
F(3,297)		59
Probability > F		0.001
Root Mean Square Error (RMSE)		.04

A) Interpret the coefficient on price. (Literally, what does it mean?)

B) Construct an approximate 95% confidence interval for the predicted value of q/N if price and income take on the mean values of city C.

C) Still focusing on the mean price and income for city C as in part (B), now assume: i) N=100, ii) it possible to carry 4 unsold units, but not more, and iii) it takes a long time to make more units, so unmet demand is just a wasted opportunity for a sale. Do these results seem accurate enough for predicting sales? Explain why or why not.

D) Suppose cost per unit is constant at $10, m=42, and N=100. Based on the regression, what price would maximize profit if capacity is 35? Show all work.

E) Evaluate the usefulness of the regression for estimating this profit maximizing price. (Use all the data given, but, assume all relevant variables have been controlled for.)

SPRING 2009 EXAM 1 SHORT ANSWER 2

Topic 6: More on Production and Cost

Initially labor costs $5 per unit, capital costs $3 per unit, and 8 units of labor (L) and 4 units of capital (K) minimize the cost of producing 100 units of output, for a total cost of $52. This is shown in the figure on the answer sheet for this question (point 'a' minimizes cost).

A) Suppose the price of labor falls to $4 *AND* the price of capital increases to $5. What does the input combination from part A cost now? Draw the new isocost line corresponding to this level of cost in the figure. (It need only have the right position relative to point 'a' and the right general slope relative to the original isocost line.)

B) Will it cost more, less, or, the same to produce 100 units under the new cost conditions of part (A) compared to the original conditions? Explain precisely why, using the figure. Draw any additional isocost lines you feel would help explain your answer.

C) Will more labor, less labor, or, the same amount be used under the new conditions of part (A) relative to the original situation? Explain why precisely, using your preferred version of the optimization condition.

D) Suppose you have two plants, A and B. Total variable cost in plant A is given by $TVC_A = 2q_A + 0.25q_A^2$. Plant B is more energy intensive, with total variable costs of $TVC_B = F + 0.5q_B + 0.05q_B^2$, where F is a start up cost incurred only if plant B is fired up. Might it ever make sense to run only plant B in this situation? If so, when and why? If not, why? (No calculations needed, just explain generally.)

E) Suppose conditions are as in part D, 39 units are produced, and F=500. How much should be produced in plant B?

SPRING 2009 EXAM 1 SHORT ANSWER 2 ANSWER SHEET

A)
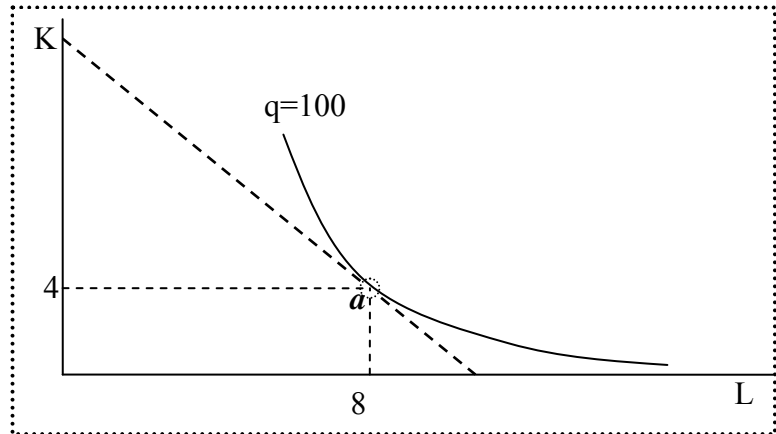
B)_____

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C)_____

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D)_____

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E)

SPRING 2009 EXAM 2 SHORT ANSWER 1
Topic 7: Game Theory

Structure
Last year, time $t=-1$, Molly was the first mover in a new market. She may play for many years. Starting this year, t=0, and continuing each year Molly plays, she faces potential competition from a different small firm that plays only one time and is replaced by another the next year. Each time an entrant enters, Molly faces a choice between fighting or accommodating.

Annual Payoffs
If Molly fights, her profit that period is 1 and the entrant's is -1. If she accommodates, her profit is 4 and the entrant's is 2. If the entrant does not enter, the entrant's profit is 0 and Molly's is 8.

Expected Present Value Multiplier
Z is a multiplier that reflects the present expected value of $1 to be received every year Molly plays, starting next year. Z reflects both the probability of the game ending and the time value of money. For example, if Molly were to receive $3 starting next year and continuing as long as she plays, and Z=4, the expected present value of the cash flow would be 4×$3=$12.

A) Draw out the extensive form of the one-shot version of this game. What is the subgame perfect Nash equilibrium? What is the non subgame perfect Nash equilibrium?

B) Assume all potential entrants in future periods (from $t=1$ on) play as follows. If Molly has ever accommodated in the past, the entrant enters. If she has never accommodated and has fought at least once in the past, they do not enter. If she has never fought or accommodated in the past, they enter if they think the probability she will fight is low enough. If the potential entrant enters this year, t=0, find the value of Z that would make Molly exactly indifferent between fighting and accommodating. Show all work.

C) Assume Molly knows her value of Z but entrants do not. Entrants think there is a 0.2 probability Z is unboundedly large (Z=∞). In this case she is "crazy" - she would fight an entrant no matter how small the potential future rewards. They also think there is a probability equal to y that Molly knows she will never play the game again after the current period, in which case Z=0. Finally, if Molly is not "crazy", and if she does not think the current play will be her last, she evaluates future cash flows as if Z=2. Will any value of y make an entrant indifferent between entering and not entering at time $t=0$? If so, what value of y does so?

D) Assume $y=0.2$. Is it a Nash equilibrium for: i) Molly to accommodate if Z=0, ii) Molly to fight if Z=2, iii) the entrant to stay out at time $t=0$, iv) future entrants to stay out as long as Molly has never accommodated an entrant in the past, and v) future entrants to enter if Molly has ever accommodated an entrant in the past? Why?

E) Why is a reputation worthless if it is too easy to acquire?

SPRING 2009 EXAM 2 SHORT ANSWER 2
*Topic 11: Perfect Competition & Topic 12: Applications of Supply and Demand Analysis

Industry Structure
Long run industry supply in a perfectly competitive industry is $S(p) = 100p - 100$ and demand is $D(p) = 800 - 50p$. Initially, there are 60 identical firms in the short run. Each firm's total variable cost is $TVC = F + q^2$ where F is a start up cost that is 0 if q=0 and 16 if q>0.

A) What is the short run equilibrium price?

B) What are long run equilibrium price and quantity? Draw the LRIS on the axes provided, and label the equilibrium price and quantity (need not be to scale).

C) Explain how the market adjusts from the short run to the long run equilibrium.

D) Suppose the government subsidizes producers at a rate of 10% per unit, so the price received by suppliers is 1.1 times the price paid by buyers: $p_S = 1.1p_D$. In the new long run equilibrium, what are p_S, p_D, and Q? Show the post-subsidy LRIS and label the p_S, p_D, and Q found in part D on the axes provided (need not be to scale).

E) How much does it cost the government in total to fund the subsidy in part D? Show the corresponding area in the figure, labeled "COST".

F) Generally, what is a deadweight loss? What is the value of the deadweight loss created by the subsidy in part D? Show the corresponding area in the figure, labeled "DWL".

G) In an increasing cost industry, why don't the firm's shareholders get the entire "producer surplus" in the long run? Who does get it?

SPRING 2009 EXAM 3 SHORT ANSWER 1
*Topic 3: Econometrics Part 1: Approximations/Regression/Using Imperfect Information

Profit Maximization with Uncertainty and the Value of Information

Inverse demand for Svetlana's product is $p = \dfrac{100}{\sqrt{q}}$. Capacity cost is \$5 per unit. Svetlana faces uncertainty about her operating cost. She thinks there is a probability of 0.4 input prices will be low and operating cost will be \$1 per unit. Otherwise, input prices will be high and operating cost will be \$3 per unit. She must choose capacity *before* the uncertainty about operating cost is resolved.

A) Let q_H represent quantity produced if operating cost is high, and let q_L represent quantity produced if operating cost is low. Set up Svetlana's profit maximization problem and solve for q_H and q_L. (Be careful with the capacity constraint here, H and L refer to cost, not demand!)

B) Svetlana can purchase a report that will provide additional information about the probability of low cost. She thinks the report will correctly signal low cost 3 times out 10, incorrectly signal low cost 2 times out of 10, correctly signal high cost 4 times out of 10, and incorrectly signal high cost 1 time out of 10. What are: i) the probability of low cost given a favorable signal, Pr(L|GN), ii) the probability of low cost given an unfavorable report, Pr(L|BN), and iii) the probability of a favorable report, Pr(GN)?

C) Let π_G represent expected profit if the report signals low cost (good news), let π_B represent expected profit if the report signals high cost (bad news), and let π_N represent expected profit if the report is not purchased. What are: i) expected profit if the report is purchased, $E(\pi \mid Info)$, and ii) the value of the report? (Just use the notation defined above for profits with good news, bad news, and, no information, rather than calculating them, but, use the actual probabilities.)

D) Suppose she could buy an *option* contract that would give her the right to buy inputs at the time of production at a price that would cause her operating cost to be \$2. If input prices turn out to be low, she would simply choose not to exercise the option. i) If she bought the option, would her capacity be higher or lower? Why? ii) Suppose she buys the option before deciding whether to buy the report. What would that do to the value of the report? Why? iii) Suppose she buys the report before deciding whether to buy the option. Will the option be worth more to Svetlana with good news or bad news? Why?

SPRING 2009 EXAM 3 SHORT ANSWER 2
***Topic 4: Individual Choice- The Theory behind Demand**

Block and Two Part Pricing

Bradley faces demand from two distinct types of customers, but, can not tell them apart to directly segment the market. He plans to implement the profit maximizing menu of block prices or two-part prices. The figure on the answer sheet shows the individual demand curves (marginal willingness to pay) for each type of customer, and also the (constant) marginal cost. There are equal numbers of each customer type.
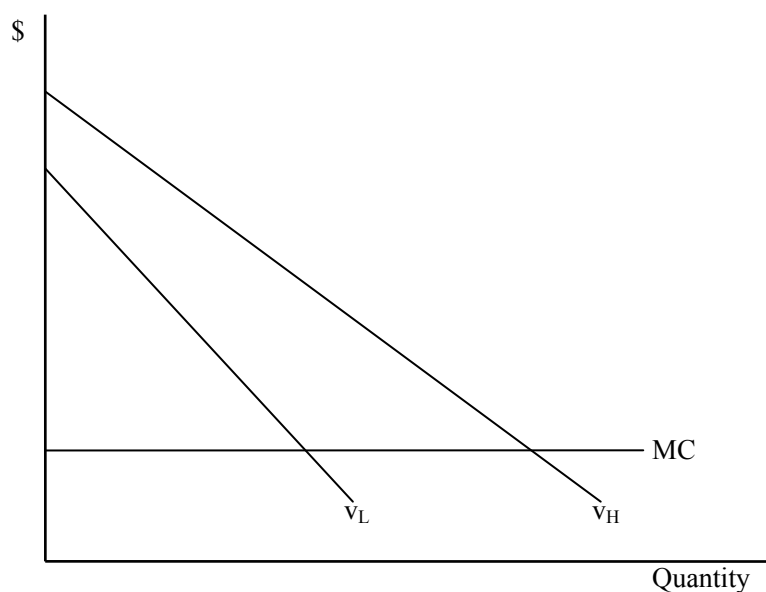
A) Label the profit maximizing quantity to sell to the "small" customer q_L^*. Explain briefly how you found it. Why is the quantity intended for the "small" customer type less than the quantity that maximizes value added? You may want to make notations in the figure and refer to them in your explanation.

B) Show the area corresponding to the "big" customer's consumer surplus in the figure by outlining it, marking it with x's, and labeling it CS_H. Why does the "big" customer keep some value added in the form of consumer surplus (assuming the "small" customer is actually served)?

C) Assuming Bradley offers a choice of two-part prices (one option with a high membership fee and a lower per unit price and another with a lower membership fee with a higher per unit price), find and label the per unit price offered with the low membership fee p_L^* in the figure.

D) Why does the quantity intended for the "big" customer maximize value added?

SPRING 2009 EXAM 3 SHORT ANSWER 3
*Topic 14: Econometrics and Bias: Omitted Variables/Endogeneity/Corrections

Econometrics and Omitted Variables Bias (OVB)
Suppose a firm collects five years worth of monthly data on units sold, price charged, advertising expenditures, family income, and demographics across 50 cities (50 x 12 x 5 = 3,000 observations). Managers in each city choose their own local advertising level and price, within a fairly large range allowed by the firm's central management.

A) What is OVB, why might it interfere with estimation of the price and advertising coefficients if this data is used to estimate a demand curve, and, what is the most likely direct cause of it in this case?

B) Under what circumstances would exploiting the panel nature of the data by including dummy variables for each city (or differencing the variables before estimating the model) overcome OVB, and, briefly, why? Under what circumstances would it not, and, briefly, why?

C) One potential way to reduce OVB is to implement a market trial. Briefly describe the problems with this approach. (We discussed three in class; you will get most of the credit if you can describe two.)

Fall 2009 EXAM 1 SHORT ANSWER 1

Peak Load Pricing

Tiffany must decide how much capacity to put in place *before* she knows exactly what operating cost per unit will be, and therefore *before* she knows how much she will produce. She can recoup a fraction of the cost of any unused capacity. Following are the particulars of her problem.

- Inverse demand is $p = 400q^{-0.5}$, or $p = \dfrac{400}{\sqrt{q}}$.

- Capacity cost is \$2 per unit.
- Production cannot exceed capacity.
- In addition to capacity cost, she will incur an operating cost that depends on labor, fuel, and materials costs at the time of future production. There is a 0.75 $(3/4)$ probability this cost will be \$5 per unit. Otherwise, it will be \$10 per unit. She will know this cost at the time of production, but not when choosing capacity.
- If she ends up producing less than capacity, she can recoup \$1 for every unused unit of capacity by using it to produce an alternative product.

A) Set up the expression for Tiffany's expected profit. Let q_L represent production if cost turns out to be low and q_H represent production if cost turns out to be high. Remember, H and L stand for cost, not demand, so, $q_H \leq q_L$.

B) Find q_H and q_L to maximize expected profit.

C) Suppose she could recoup *less* of the cost of unused capacity, say \$0.50 instead of \$1 per unit. Would q_L increase or decrease, and why? Would q_H increase or decrease, and why? (No math needed, just explain.)

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D) Suppose Tiffany could hire a consultant to provide additional, but still imperfect, information on the probability of high and low cost before she incurs capacity costs. How do changes in the fraction of capacity cost she can recoup for unused capacity affect the value of that information, and why? (No math needed, just explain.)

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Fall 2009 EXAM 1 SHORT ANSWER 2

Indifference Curve

Andrew has $32 to spend weekly on lunch and dinner. He buys only pizza slices and hamburgers. When the price of pizza is $2 per slice and the price of hamburger is $4 per burger, he buys 4 burgers and 8 slices of pizza. This is shown in the figure on the answer sheet, where he reaches the utility level associated with indifference curve I.
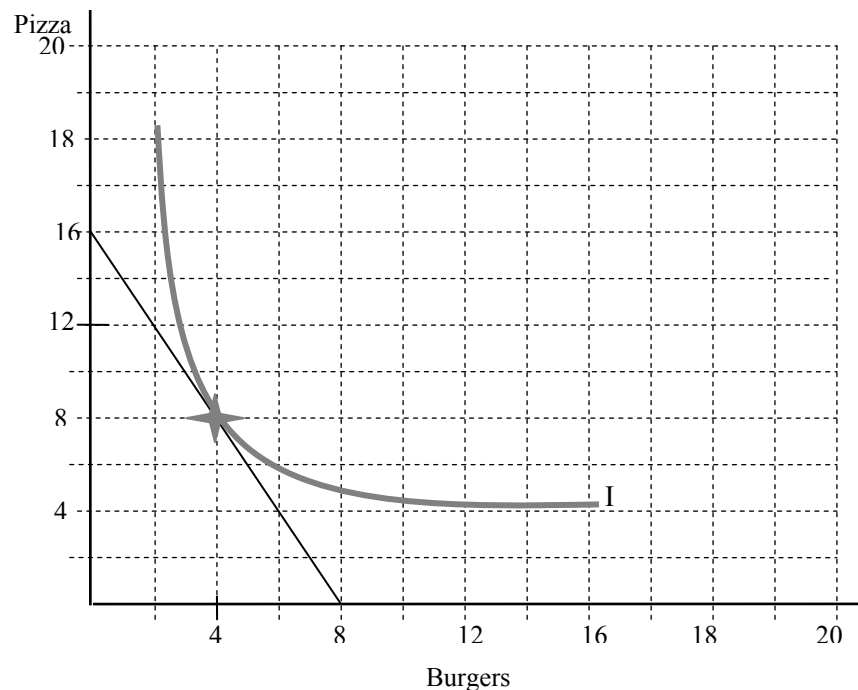
A) Write out a version of the optimization condition that must hold at the solution to the consumer's choice problem shown in the figure (4 burgers and 8 pizza slices). Explain precisely in words what this means.

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Now suppose the price of a pizza slice increases to $3 and the price of a burger falls to $2.

B) Can he still afford the original bundle? Show your work.

C) Draw the new budget line (given the new prices) in the figure on the answer sheet. Make sure it has the right slope and the right relationship to the original consumption bundle.

D) Use a version of the optimization condition to explain precisely why the original bundle of 4 burgers and 8 slices of pizza is not optimal at the new prices. Also, use it to explain how the consumption bundle will change. (You should show how the condition is violated at the original bundle after prices have changes, and *explain* clearly in words what this means, why it leads to a change in the consumption bundle, and what that change is.)

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E) Is Andrew able to achieve a higher or lower level of utility after the price change? Why?

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F) In the figure, draw the budget line corresponding to the level of income that would allow Andrew to reach the same level of utility at the new prices as he reached at the original prices.

Fall 2009 EXAM 1 SHORT ANSWER 3
Econometrics
The table below shows the results of two regression models of the relationship between quantity sold, price, per capita income, advertising, and population (per capita income, advertising, population, and quantity are all measured in thousands). In Model 1, the dependent variable is quantity sold. In Model 2, the dependent variable is quantity divided by population, or quantity per capita, and population is not included as an explanatory variable. The models were estimated on 100 observations across four cities.

	Model 1: Dep Var Quantity			Model 2: Dep Var Quantity / Population		
	Coefficient	Std Err	p-Value	Coefficient	Std Err	p-Value
Price	-2.13	0.2941	0.0000	-0.02	0.0026	0.0000
Income	0.39	0.0366	0.0000	0.004	0.0003	0.0000
Advertising	0.09	0.0742	0.2285	0.0002	0.0007	0.7207
Population	0.27	0.0144	0.0000	--	--	--
Intercept	-6.07	3.1459	0.0565	0.23	0.0259	0.0000
R-Square	0.85			0.71		
RMSE	4.20			0.03		
F-Statistic	132.15			77.15		
p-Value (F)	6E-38			2E-25		

A) Interpret the price coefficient in model 2. Literally, what does it mean?

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B) The formula for the F statistic is $F = \dfrac{\sum_i (\hat{Y}_i - \bar{Y})^2 / K}{\sum_i (Y_i - \hat{Y}_i)^2 / (n - K - 1)} = \dfrac{SSM/K}{SSE/(n-K-1)}$. In words,

what does the numerator represent? In words, what does the denominator represent? (DON'T just spell out the words for the abbreviations. What do they represent intuitively?) What does it mean if the p-Value of the F-Statistic is "small"?

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C) Why should one avoid extrapolating to situations where the independent variables would take on values that lie outside the range of the sample data? How is checking for that different in a model with multiple independent variables than in one with only one independent variable?

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D) What are predicted sales for Model 1 if price is 5, per capita income is 40, advertising is 20, and population is 100. Construct an approximate 95% confidence interval for predicted sales.

E) What are predicted sales per capita for Model 2 given the independent variable values in part D? Construct an approximate 95% confidence interval for predicted sales per capita.

F) Using the results from part E, construct an approximate 95% confidence interval for sales based on Model 2, for the independent variable values given in part D.

G) For purposes of predicting quantity demanded, which model seems more accurate, and, why?

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Fall 2009 EXAM 2 SHORT ANSWER 1
Game Theory
Mike and Liz engage in differentiated product price competition. Mike produces a higher end product than Liz. Liz has a leaner cost structure than Mike. They can each compete "Hard" or "Soft" - that is charge high or low prices. Mike does not benefit from pricing low when Liz prices high because his cost is higher and even if he charges a break even price he will not attract many customers from Liz. Liz, however, does benefit from undercutting Mike, since her cost structure is lean. Payoffs are shown in the normal form representation of the simultaneous move game on the right (and again on the answer sheet).

A) Indicate each player's best responses and find the simultaneous play Nash equilibrium.

		Mike	
		Soft	Hard
Liz	Soft	L: 20 M: 15	L: 0 M: 10
	Hard	L: 30 M: 0	L: 5 M: 5

B) Suppose Liz goes first. Draw the extensive form representation (game tree) and find the subgame perfect Nash equilibrium.

C) Suppose Mike goes first. Draw the extensive form representation (game tree) and find the subgame perfect Nash equilibrium.

D) Suppose the game is played out over four days. Each player can choose to announce their pricing strategy on either day two or day three. On day one, each player must announce whether their pricing strategy will be announced on day two or day three. Customers make purchases on day four. Thus, the players play an extended game where the first choice is when to announce their pricing strategy – the players determine the timing of the game themselves. If Liz announces her price on day 2 and Mike on day 3, the final outcome will be as in part B – Liz is the first mover. If Mike announces on day 2 and Liz on day 3, outcomes are like part C – Mike is the first mover. If both announce on day 1 or both announce on day 2, the outcome is like part A, a simultaneous move game. Draw a normal form representation of the strategic choice of when to announce price. Find the Nash equilibria of this extended game. What is the most reasonable solution? Why?

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Fall 2009 EXAM 2 SHORT ANSWER 2

Esteban and Katie engage in simultaneous quantity competition. Inverse demand for Esteban's product is $p_E = 18 - 0.5q_E - 0.4q_K$ and inverse demand for Katie's product is $p_K = 18 - 0.5q_K - 0.4q_E$. Esteban's total cost function is $C_E(q_E) = 4q_E$ and Katie's is $C_K(q_K) = 4q_K$. SHOW YOUR WORK!!!

A) Set up Esteban's profit function and find his reaction function.

B) In the Nash equilibrium of the simultaneous move game, $q_E = q_K = 10$ and $\pi_E = \pi_K = 50$. If the two firms cooperate and produce the quantities that maximize joint profit, each produces 7.78 and each makes a profit of 54.44. Suppose Esteban is "cooperating" but Katie decides to take advantage of that fact and maximize her profit. Set up her profit function, find the quantity that would maximize it, and calculate her corresponding profit.

C) Suppose the game is repeated indefinitely, the interest rate is 0.05, and the chance the game ends after any given play due to product obsolescence is 0.05. Is cooperation a possible Nash equilibrium to the repeated game?

D) Why does noise mean forgiveness is important in cooperative strategies in repeated games, AND, why does noise mean optimal strategies will call for "punishment" even when everyone is sure no one "cheated"? (The two are closely related.)

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Fall 2009 EXAM 2 SHORT ANSWER 3
There are three separate but brief questions.

3A) In the demonstration of the Ellsberg paradox, an urn is filled with marbles of 3 colors, say white, orange, and blue. The proportion of only one of the colors is known. For our purposes, say one third are known to be white. Subjects are offered a choice between two lotteries, say A and B, and then between two other lotteries, say C and D. The lotteries are as follows.

Lottery A: The subject wins if they draw a white marble.
Lottery B: The subject wins if they draw an orange marble.

Lottery C: The subject wins if they draw an orange or a blue marble.
Lottery D: The subject wins if they draw a white or a blue marble.

i) What is the usual outcome? (That is, what are the usual choices?)
ii) Why is the usual outcome contrary to the subjective expected utility model?
iii) What does the usual outcome of this "experiment" imply about individual choice under uncertainty?

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Production and Cost

3B) Highly skilled workers (H) perform high level analysis and synthesis of new information and create new techniques to solve problems. Moderately skilled workers (M) apply intricate and advanced techniques to complex problems, but only once the technique for doing so has been developed and shown to them by a highly skilled worker. In the US, highly skilled workers cost $120 per hour and moderately skilled workers cost $40. In developing countries, highly skilled workers are scarce and hard to attract and retain, and so cost $160, but the abundance of moderately skilled workers means they cost only $10. Would the ratio of highly to moderately skilled labor (H/M) used by a firm in a developing country be higher or lower than a firm in the US when producing the same output level? Why? Use the optimization condition for cost minimization derived in class to explain precisely.

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Homogenous Product Market

3C)

i) Draw reaction functions representative of two firms, A and B, engaged in simultaneous one shot differentiated price competition on the axes provided on the answer sheet. Label them R_A^0 and R_B^0. Label the initial Nash equilibrium prices p_A^0 and p_B^0.

ii) Now, suppose A's marginal cost falls. Show A's new reaction function, labeled R_A^1, and label the new Nash equilibrium prices p_A^1 and p_B^1.

iii) Starting from the same initial profit, does the cost reduction increase A's profit more or less than if they were a monopolist? Why?

Answer parts i-ii in the figure to the right and part iii on the lines below.

_____

_____ p_B

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p_A
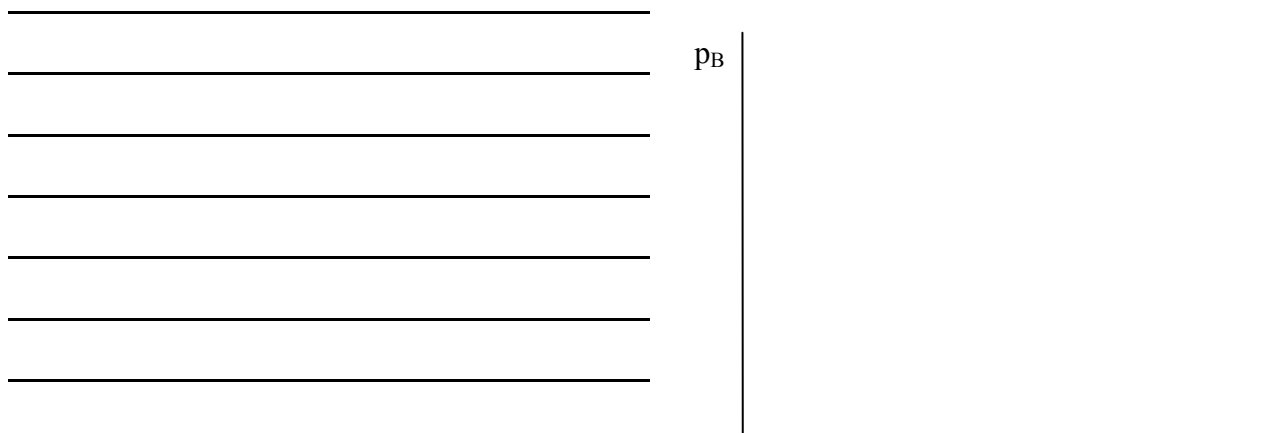
OLD SHORT ANSWER EXAM KEYS

SUMMER 2006 EXAM 1

Name: **KEY**   UFID#_____

SHORT ANSWER 1. (15 Points)

Dan hires Amy for one year, and one year only. If Amy works hard, Dan's payoff is $200 and Amy's is $100. If Amy shirks, Dan's payoff is $50 and Amy's is $150. After the year is over, Dan can punish Amy if she shirks by going out of his way to make sure she has a hard time finding other work that pays well. Inflicting this punishment costs Dan $50 and costs Amy $200. The costs of punishment are in addition to other payoffs.

A) Draw the extensive form (game tree) for this one shot game. (6 points)

```
 ┌──────┐                ┌──────┐                          A: -50
 │ Amy  │ ───▶  Shirk ──▶│ Dan  │ ───▶  Punish  ───▶       D:   0
 └──────┘                └──────┘
    │
    │                                    Don't Punish ──▶   A: 150
    │                                                       D:  50
    ▼
       Hard  ───▶   A: 100
                    D: 200
```
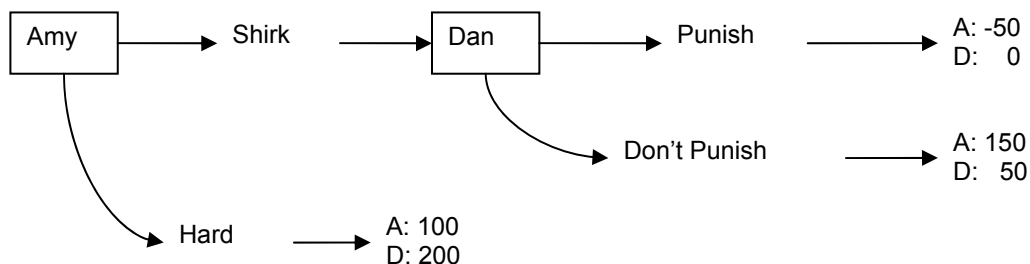
All correct: 6 points (if they include a "punish" option for Dan when Amy works hard, do not penalize).
Correct order, wrong payoffs: 4-5 points
Any extensive form: 3 points

B) What is the sub-game perfect Nash equilibrium (spne) of this game if it is played once, there is complete information, and everyone is rational, and, why is this the most reasonable outcome of this game under these circumstances? (Two to four concise sentences.) (5 points)

In the SPNE, Amy shirks and Dan does not punish her. This is the most reasonable outcome because punishing Amy costs Dan $50 and gains him nothing, so, he will not punish. Knowing this, Amy will not work hard.

C) Now suppose Dan will have to hire a manager every year and there is some chance Dan is the kind of person who will always punish a shirking manager, no matter what. How likely must Amy think it is that Dan will punish her for shirking to induce her to work hard? Show your work. (4 points)

$$f(-50) + (1-f)(150) \leq 100$$
$$150 - 200f \leq 100$$
$$50 \leq 200f$$
$$.25 \leq f$$

Amy must think that there is at least a 25% chance Dan will punish her for her to work hard.

Work & explanation: 4 points. Work & right answer with no explanation: 4 points. Right set up & sentence with algebra error: 3 points. Right answer & explanation with no work: 3 points. Set up equality of expected values, but, no or wrong result: 2 points

SUMMER 2006 EXAM 1

Name: **KEY**   UFID#_____

SHORT ANSWER 2 (10 Points)

Jennifer and Lindsay are the only two producers of widgets – a completely homogenous product, and engage in quantity competition. The inverse demand for widgets is given by $p = 20 - .5Q$. Lindsay's constant marginal cost is 5. Lindsay moves first. She knows Jennifer's reaction function is $q_J = 10 - .5q_L$.

A) Write Lindsay's profit function in the first period of the two stage game. (5 points)

$$\pi = (20 - .5q_L - .5(10 - .5q_L))q_L - 5q_L \text{ (5 points)}$$
$$\pi = (15 - .25q_L)q_L - 5q_L \text{ (5 points)}$$
Any correct version of this (5 points)
Partial Credit at your discretion.

B) Write the condition for maximizing Lindsay's profit. (3 points)

LOOK FOR SOME OF THIS IN C ALSO!
Correct Derivative of whatever is in A = 0: 3 points
Correct Marginal Revenue from A = Marginal Cost from A: 3 points
Error calculating derivative, MR or MC from A: 2 points

Just write $\dfrac{d\pi}{dq} = 0$: 2 points

Just write MR=MC: 2 points

C) Solve for Lindsay's optimal quantity. Label your solution clearly. (2 points)

Correct solution based on B: 2 points
Tried reasonably to solve it: 1 point

SUMMER 2006 EXAM 1

Name **KEY**   UFID#_____

SHORT ANSWER 3 (15 points)

Ryan and Charles produce slightly differentiated gadgets. The demand for Ryan's gadgets is $q_R = 20 - .5p_R + .25p_C$. Ryan's unit cost is constant and equal to $2.

A) Write Ryan's profit function. (3 points)

$$\pi = (20 - .5p_R + .25p_C)p_R - 2(20 - .5p_R + .25p_C)$$ (3 points)

Any correct version of this, 3 points.
Partial credit at your discretion.

B) Write the condition for maximizing Ryan's profits. (2 points)

$$\frac{d\pi}{dp} = 20 + .25p_C - p_R + 1 = 0$$ (2 points)

Any correct version of this, 2 points. Correct derivative or MR=MC based on A: 2 points
Any notion of MR=MC or derivative: 1 point.

C) Solve for Ryan's reaction function. (1 point)

$$p_R = 21 + .25p_C$$ (1 point) Correct solution of whatever is in B: 1 point

D) Draw Ryan's reaction function and Charles' reaction function on the axes provided. (The reaction functions should have generally the right shape, they need not be to scale, and, you need no quantitative information about Charles' demand or cost for this problem.) Label each player's reaction function clearly. Label the equilibrium prices.
(4 points)
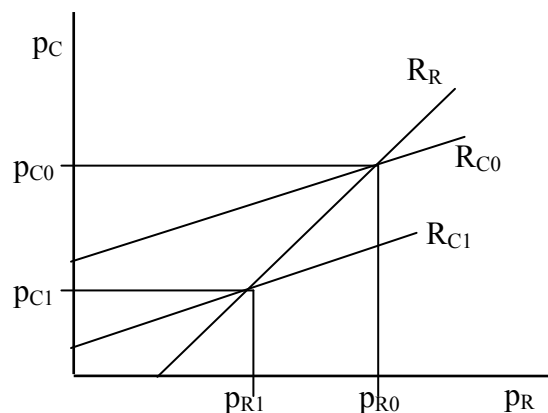
Sloping up, no labels: 3 points
Other partial credit your discretion!

E) Suppose Charles invests in lowering his marginal cost of production. Show the effects of this investment in your figure. Label the new equilibrium prices clearly. (2 points)
Any shift of reaction functions: 1 point. Any notion that prices decreases: 1 point

F) Does Charles gain more or less from investing in cost reduction than a pure monopolist would at the same initial output and demand elasticity? Why? (One or two concise sentences only). (3 points)

Less, because Ryan responds by lowering his price, reducing the demand for Charles' product. 3 points
Any notion that Ryan's response cuts into Charles' gains: 2 points
Anything that makes any sense at all: 1 point

SUMMER 2006 EXAM 2

Name____KEY_____   UFID#_____

SHORT ANSWER 1. COST MINIMIZATION (20 Points)

A) Write down the two general conditions for minimizing the cost of producing 12 units of output (q) when the production function is $q(K,L)$ (where K is capital input and L is labor input) and input prices are w=20 and r=10 (w is the price of labor and r is the price of capital). Follow each condition with a very brief interpretation of the condition, or, an explanation of why it must be true to minimize cost. Use only the space provided.
(10 points)

Condition 1
3 points for the condition, 5 for the explanation. Other versions OK
$\dfrac{MP_L}{w} = \dfrac{MP_K}{r}$: If the last unit of one input employed produced more output per dollar than the last unit of the other, substituting the one that is more productive per dollar for the other will reduce cost.

Condition 2:
2 points for the explanation or the condition.
$q(K,L) \geq 12$: Enough inputs must be used to produce the required output

B. Suppose the production function is given by $q = 2K^{.5} + 4L^{.5}$ and the production target and input prices are as given in part A. Write down the cost minimization problem, including any necessary constraints. (5 points)
The main part is getting the equation for cost. Take off only 1 point for not writing the choice variables or the constraint properly.

Minimize C(q)= <u>20L+10K</u>
    By choosing: <u>L</u> and <u>K</u>
Subject to the constraint(s): <u>$q(K,L) \geq 12$</u>

C. What values of K and L minimize the cost of producing 12 units? (Show your work). (5 points)
Partial credit at grader's discretion
$MP_L = \dfrac{2}{\sqrt{L}}$ and $MP_K = \dfrac{1}{\sqrt{K}}$. $2\sqrt{\dfrac{K}{L}} = \dfrac{20}{10} \rightarrow K = L$
$12 = 6\sqrt{L} \rightarrow 2 = \sqrt{L} \rightarrow L = K = 4$
If anyone sets it up properly as a Lagrangian, give extra credit:
$\mathcal{L} = 20L + 10K + \lambda(12 - 2K^{.5} - 4L^{.5})$

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 2. PERFECT COMPETITION. (28 Points)

A perfectly competitive industry is composed of identical firms with marginal cost equal to $.1q$. The minimum average cost is $5, and is attained when a firm produces 50 units.

A) If market demand is given by $Q = 10000 - 500p$ and there are 50 firms in the industry, what are the short run equilibrium price (p) and industry output (Q), and, how much does each firm produce (q)? (8 points)

Most credit is for the relationships $.1q = p$
2 points p=MC to get q(p). $q = 10p$
2 points industry supply is 50q
1 point Supply=Demand for p $Q = 500p$
1 point for plugging p into Supply or $500p = 10000 - 500p$
      demand to get Q $1000p = 10000$
1 point for q=Q/n
1 point if all algebra is correct $p = 10$
Other partial credit at grader's discretion $Q = 500(10) = 5000$
                                                $q = 10(10) = 100$

B) In the long run, what is industry output (Q) and how many firms comprise the industry (n)? (Assume the minimum average cost does not increase as total industry output increases.) (8 points)

Most credit is for the relationships $Q = 10000 - 500(5) = 7500$
3 points p=min AC to get q & p.
2 points Q is demand at p=min AC $n = \dfrac{7500}{50} = 150$
2 points n=Q/q
1 point if all algebra is correct
If all relationships are written generally
    with no attempt to apply the
    parameters of this problem, take off
    2 points, not just 1
Other partial credit at grader's discretion

C) Draw the long run industry supply curve in the figure below, labeled S_{LR}. Label the long run equilibrium quantity for the initial demand calculated in part B. (5 points)
3 points for supply curve
2 points for labeling equilibrium
If they show upward sloping supply, take off 1 point
Other partial credit at grader's discretion

D) Show the effect of an increase in the price of a product that is a complement in consumption on the industry equilibrium in the figure, labeling the new equilibrium quantity Q_2^e. (7 points)
2 points for any demand shift
3 points for shifting demand down
2 points for labeling new equilibrium
Other partial credit at grader's discretion
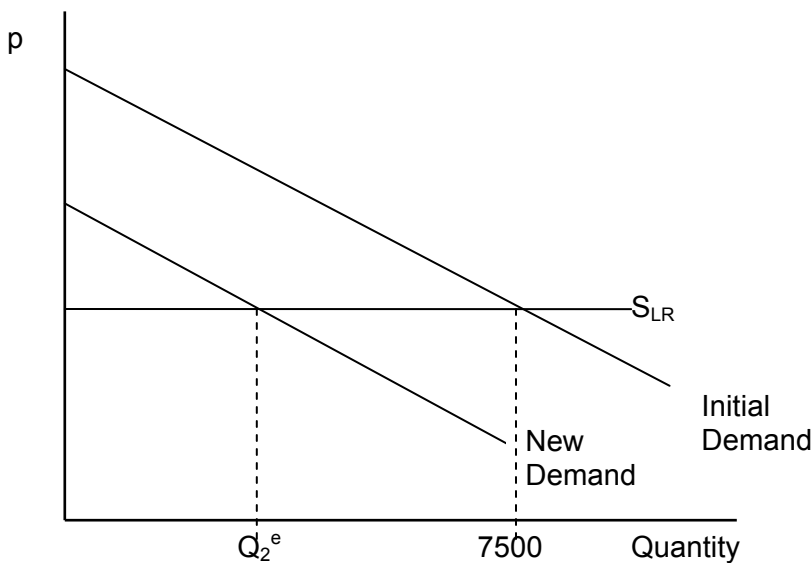
SUMMER 2006 EXAM 2

Name_____　　　　UFID#_____

SHORT ANSWER 3. MENU PRICING (32 points)

A firm sells an identical product to two types of consumers with willingness to pay given by $V_1(q_1) = 10q_1 - .5q_1^2$ and $V_2(q_2) = 8q_2 - q_2^2$ respectively. There is one type 1 consumer and there are 2 type 2 consumers. The firm can not directly segment the market, but, can offer different size packages at differing prices (resale is not possible), tailoring a different package for each consumer type. The constant marginal cost of output is $2.

A) Write down the firm's profit maximization problem, including a numbered list of all constraints (including constraints that do not bind). Let q_1 and P_1 represent the size and price of the package intended for the single type one consumer. (So P_1 is not the price per unit, but rather the price of q_1 total units.) Similarly, P_2 and q2 represent the price and size of a package intended for each type 2 consumer. (6 points)

2 points for the problem, 1 for each constraint. Don't necessarily deduct every time for the same error repeated in each constraint. Partial credit at grader's discretion.

Maximize $\pi = $ $\underline{P_1 + 2P_2 - 2q_1 - 4q_2}$ or $\underline{n_1 P_1 + n_2 P_2 - 2q_1 - 4q_2}$

　By choosing: <u>P_1, P_2, q_1, and q_2</u>
　Subject to:　1) $10q_1 - .5q_1^2 - P_1 \geq 0$ or $V_1 - P_1 \geq 0$
　　　　　　　2) $8q_2 - q_2^2 - P_2 \geq 0$ or $V_2 - P_2 \geq 0$
　　　　　　　3) $10q_1 - .5q_1^2 - P_1 \geq 10q_2 - .5q_2^2 - P_2$ or $V_1(q_1) - P_1 \geq V_1(q_2) - P_2$
　　　　　　　4) $8q_2 - q_2^2 - P_2 \geq 8q_1 - q_1^2 - P_1$ or $V_2(q_2) - P_2 \geq V_2(q_1) - P_1$

B) For each constraint in part A, write one sentence giving its meaning. Number the sentences to correspond to the numbers in the list of constraints in part A. (8 points) 2 points each. Order does not matter.

1) Type 1 can't be charged more than their maximum willingness to pay.
2) Same as 1, but, for the other type (OK if this is actually written.)
3) Type 1 must prefer their bundle and price to that offered to type 2.
4) Same as 2, but, for the other type. (OK if this is actually written.)

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 3. MENU PRICING (Continued)

C) Write the number of each constraint that binds followed by a brief explanation of why it binds. (8 points)

Answer order will depend on the order in which the constraints wee given. 4 points for getting each binding constraint right, or, 2 for at least getting that a different constraint binds for each type. 2 points for each explanation.

Constraint 3 binds because the high demand consumer can always get some consumer surplus choosing the low demand consumer's bundle. Therefore, they must be allowed that much surplus in their bundle, but, all additional surplus is extracted as profit by increasing price.

Constraint 2 binds because raising the price of the low demand consumer's bundle increases profit and allows a higher price for the high demand consumer, so the highest possible price is charged to low demand customers.

D) Other than which constraints bind, is there any other useful fact that is always true about the quantity produced for either the large or small consumer type in this kind of problem? If so, briefly state it, and provide some intuition for why it is true. (5 points)

3 points for the fact, 2 for the explanation, partial credit at the grader's discretion.

The high demand consumer's quantity is always set at the level that maximizes surplus value for that type, or, the quantity where the price their inverse demand crosses marginal cost. Since the price charged t them is higher the higher the surplus generated from their consumption, profit is maximized by making that surplus as large as possible – then taking as much of it as possible.

E) What are the profit maximizing values of q_1, q_2, P_1, and P_2? Show your work. (5 points)

1 Point for starting from the 2 binding constraints
1 point for plugging into the profit function correctly
2 points for a reasonable attempt from there
      (Partial credit at the grader's discretion)
3 points if there are no algebra mistakes

$8q_2 - q_2^2 = P_2$

$10q_1 - .5q_1^2 - P_1 = 10q_2 - .5q_2^2 - P_2$

$P_1 = 10q_1 - .5q_1^2 - 10q_2 + .5q_2^2 + P_2$

$P_1 = 10q_1 - .5q_1^2 - 10q_2 + .5q_2^2 + 8q_2 - q_2^2$

$P_1 = 10q_1 - .5q_1^2 - 2q_2 - .5q_2^2$

$\pi = 10q_1 - .5q_1^2 - 2q_2 - .5q_2^2 + 2(8q_2 - q_2^2) - 2q_1 - 4q_2$

$\dfrac{\partial \pi}{\partial q_1} = 10 - q_1 - 2 = 0$

$q_1 = 8$

$\dfrac{\partial \pi}{\partial q_2} = -2 - q_2 + 16 - 4q_2 - 4 = 0$

$5q_2 = 10$

$q_2 = 2$

$P_2 = 8q_2 - q_2^2 = 16 - 4 = 12$

$P_1 = 80 - 32 - 20 + 2 + 12 = 42$

SUMMER 2006 EXAM 2

Name_____   UFID#_____

SHORT ANSWER 4-6. Conceptual Questions (20 points)

4) In any industry with no significant barriers to entry, long run equilibrium is characterized by two types of conditions. Write them, along with a brief explanation of why they are satisfied in equilibrium. For purposes of this question, consider the general case in which firms are not necessarily identical. (10 points)

Condition 1: **5 points** $MR = MC$: Individual firms are maximizing profits.
If p=MC is written instead, as in perfect competition, with the explanation that this is the
    profit maximizing condition, deduct 1 point.

Condition 2: **5 points** P≈AC, so there is no incentive for entry or exit. Also accept profit=0
or π=0.
If MC=AC is written, as is correct only for perfect competition, deduct 1 point.
Explaining that this need hold only for the least efficient firm that enters, the "marginal"
    firm, give 1 extra credit point.

Other partial credit at grader's discretion.

5) List three ways in which a firm may commit to an entry limiting quantity and price. (5 points)

Partial credit for other reasonably related ideas at grader's discretion. Any 3 of the following, 5 points. 2 of them, 4-5 points, depending on the quality of what else is written. Only 1, 2-4 points, depending on the quality of what else is written.

1) By investing in technology to lower its marginal cost.

2) By moving very rapidly along the learning - producing more than otherwise optimal – to learn ways to reduce marginal cost.

3) Investing in a reputation as a tough competitor.

4) Raising costs for all firms, so competitors will not enter, for example by lobbying for regulation.

6) Why is "commitment" important in entry limit pricing strategies? (5 points)

Partial credit at grader's discretion
Absent commitment, potential entrants anticipate that the incumbent will charge the profit maximizing price, not an entry limiting price, or, extremely low price, once entry has actually occurred. Therefore, they will not be deterred from entering.

FALL 2006 EXAM 1

SHORT ANSWER 1. (33 Points)   UFID# <u>SHORT ANSWER KEY</u>

Wendy is the incumbent provider of thingamabobs in Medium City, and, is considering improvements to her facility. Hana is considering opening a competing business. If Wendy improves her facility and Hana enters, Wendy's payoff is $40 and Hana's is -$10. If Wendy improves her facility and Hana does not enter, Wendy makes $60 and Hana makes $0. If Wendy does not improve her facility and Hana enters, Wendy's payoff is $20 and Hana's is $30. Finally, if Wendy does not improve her facility and Hana does not enter, Wendy's payoff is $80 and Hana's is $0.

A) Assuming Wendy and Hana move simultaneously, represent this game in normal form. Clearly circle and label the cells corresponding to any pure strategy Nash equilibra. If there are no pure strategy Nash equilibria, find the probability that Wendy improves her facility in the mixed strategy equilibrium. (14 points)

		Hana	
		Enter	Don't
Wendy	Improve	W: 40 H: -10	W: 60 H: 0
	Don't	W: 20 H: 30	W: 80 H: 0

$$f_I(-10) + (1 - f_I)30 = f_I(0) + (1 - f_I)0$$
$$-10f_I + 30 - 30f_I = 0$$
$$30 = 40f_I$$
$$f_I = \frac{3}{4}$$

B) Now assume Wendy moves first. Draw the extensive form (game tree) for this one shot game. Clearly indicate the Nash equilibrium (equilibria) of this game. (14 points)
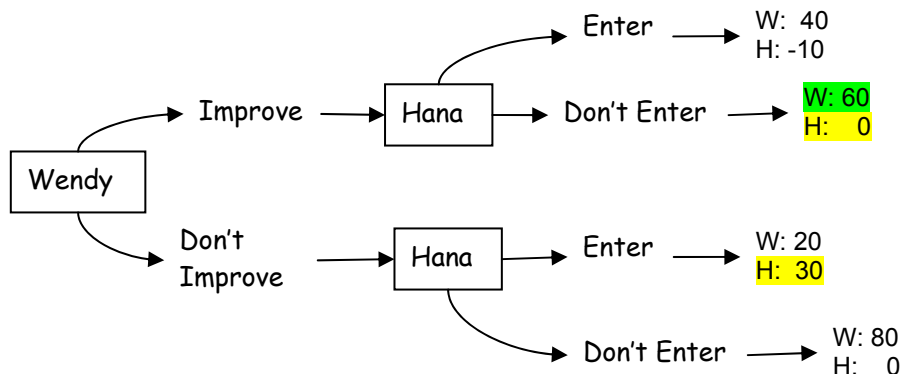
Unique sequential NE is for Wendy to Improve, and Hana Not to Enter.

C) Would Wendy rather move first or second in this game? Briefly, explain why. (Write only what can fit in the space provided.) (5 points)

Second. If Hana enters, Wendy can and would respond by improving. Knowing this Hana does not enter. Therefore, Wendy can maintain her market without improving, earning 80 instead of 60.

FALL 2006 EXAM 1

SHORT ANSWER 2 (33 points)   UFID# <u>SHORT ANSWER KEY</u>
Marianna and Lindsay are the only two producers of widgets – a completely homogenous
product – and they and engage in simultaneous non-cooperative quantity competition (Cournot).
The inverse demand for widgets is given by $p = 20 - .5Q$. Each player's constant marginal cost
is 5.

A) Set up the players' profit functions and solve for the equilibrium quantity for each player.
Make sure to keep your work neat and organized, so we can follow the flow in grading. If you
need to use arrows to show the order of steps, do so. If you rely on any special simplifications
that may be relevant in this case, be sure to point out what you are doing. (16 points)

$\pi_L = (20 - .5(q_L + q_M))q_L - 5q_L$

$\pi_M = (20 - .5(q_M + q_L))q_M - 5q_M$

$\dfrac{d\pi_M}{dq_M} = 20 - .5q_L - q_M - 5 = 0$

$15 - .5q_L = q_M$

By symmetry, $q_M = q_L$ in the N.E.

$15 - .5q_M = q_M$

$15 = 1.5q_M$

$q_M = 10$

$q_L = 10$

B) Draw the players' reaction functions on
the axes provided. Label the initial
equilibrium quantities appropriately. (5
points)
C) Show the effect of a reduction in
Marianna's marginal cost in the figure,
labeling the new equilibrium quantities q_{M2}
and q_{L2}. (You don't need specific numbers
here, just show things moving in the
appropriate direction.) (5 points)
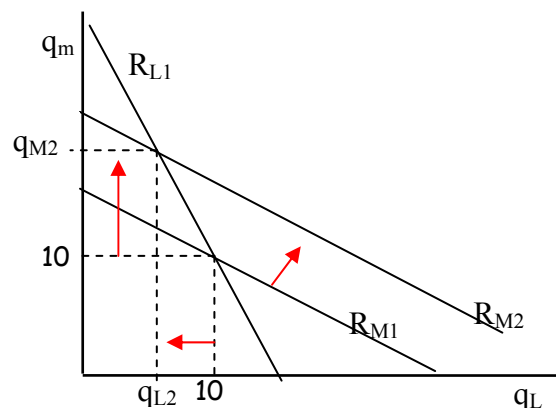
D) Does Marianna gain more or less from this cost reduction than would a monopolist facing the
same demand as the initial residual demand faced by Marianna? Very briefly, why? (7 points)

More. Because the strategic effect lowers Lindsay's quantity, adding a strategic
advantage to the cost advantage.

FALL 2006 EXAM 1

SHORT ANSWER 3 (33 points)   UFID# SHORT ANSWER KEY

A) Suppose the production function for gadgets is given by $q = KL^2$, where L is labor input and K is capital input. Further, suppose the wage rate is \$10 and the cost of capital per unit is \$20. Find the minimum cost of producing 8 widgits. (11 points)

$$\frac{MP_L}{w} = \frac{2KL}{10} = \frac{L^2}{20} = \frac{MP_K}{r}$$

$$4K = L$$

$$8 = 16K^3$$

$$K = \sqrt[3]{.5}$$

$$L = 4\sqrt[3]{.5}$$

$$C = 10L + 20K = 40\sqrt[3]{.5} + 20\sqrt[3]{.5} = 60\sqrt[3]{.5} \approx 48$$

B) Explain briefly, in words, what the 2 conditions that determine the cost minimizing input combination for producing any given production target are, and, why they must be satisfied to minimize cost. (11 points)

Optimization Condition
a) $MP_L/w = MP_K/r$. If the last unit of one input employed produced more output per dollar than the last unit of the other, substituting the one that is more productive per dollar for the other will reduce cost. Other versions OK

Production Constraint
Enough inputs must be used to produce the required output

C) The graphs below represent a typical firm in a perfectly competitive industry in long run equilibrium, and, the supply and demand curves in the industry. Draw the initial long run industry supply curve, assuming firm level cost curves are not affected as the industry expands, and label it LRS. Then, show the effect of a per unit tax of \$2 (levied on firms) on the firm and the industry in the long run, including showing shifts in all affected curves. (11 points)
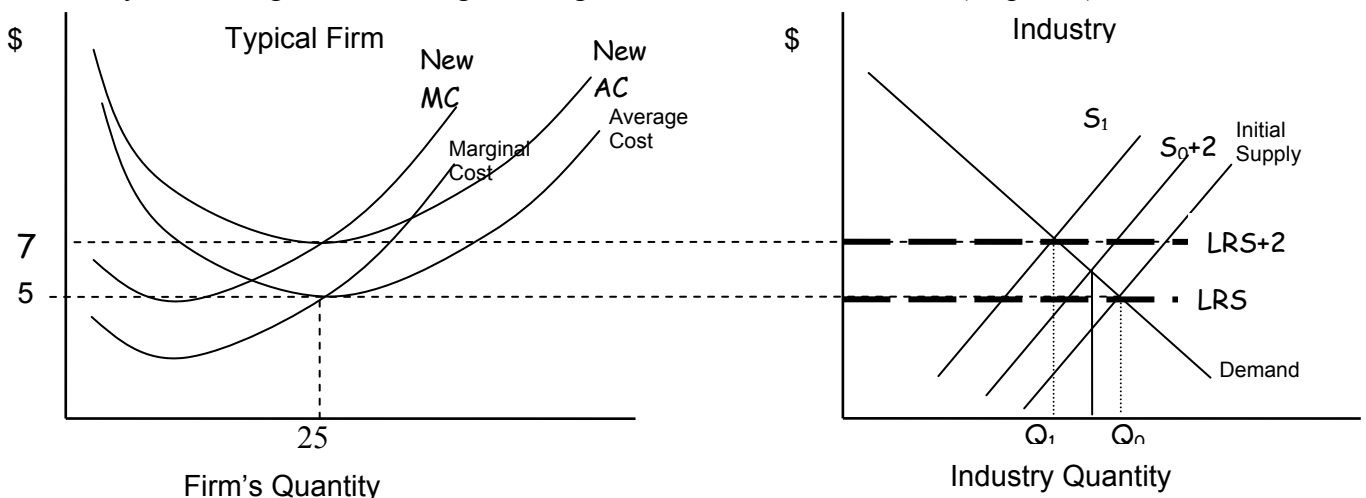
FALL 2006 EXAM 1

SHORT ANSWER 4 (33 points)   UFID# <u>SHORT ANSWER KEY</u>
Provide a very brief answer to **4** of the following 6 questions, using only the space provided.*******

A) If there are 2 Nash Equilibria in a sequential game, one of which is subgame perfect, why is the subgame perfect one a more reasonable prediction of the outcome of the game? (8.25 points)

Because it rules out non credible or irrational threats. Or, because it involves every player maximizing at every point where they might get a choice.

B) If there are no entry barriers, what are the 2 conditions that must be satisfied in order for a homogenous product industry in which firms engage in quantity competition to be in long run equilibrium? (8.25 points)

MR=LRMC
P=LRAC

C) Why can't cooperation be sustained in games with a finite and known end period? (8.25 points)

Because, in the last period, rational players will cheat. Other rational players predict this, eliminating any reason to cooperate in the next to last period. This removes any incentive to cooperate in the period before, and, so on.

D) Why is it more difficult to sustain cooperation when there are more players? (8.25 points)
1) Because the gains from cooperation are spread over more players.
2) Because the costs of monitoring rise with the number of players monitored.

E) Why might rational players carry through with threats or promises that would not be optimal in a one shot game if they will play a large, but finite and know, number of times and there are a small number of "crazy" players, at least from most players' points of view? (8.25 points)

To gain a reputation as tough, honest, etc... that will yield more profit in the LR than sacrificed in the SR.

F) What happens to the incentive for rational players to mimic the behavior of "crazy" players as they draw nearer the last period in which they will play a game? (8.25 points)

It declines, as there is little time left to gain the LR benefits from maintaining a reputation.

FALL 2006 EXAM 2

SHORT ANSWER 1.   UFID#_____KEY_____

Your firm must produce output before knowing final demand with certainty; you know only that it might be either a high demand period or a low demand period. In a high demand period, inverse demand is $p_H = 20 - .25q_H$ In a low demand period, inverse demand is $p_L = 16 - .25q_L$. If you produce more than is sold, it is not economical to store output until next period. The constant marginal cost per unit is $1.5. You have paid for a forecast of demand for the past 100 periods, the results of which are summarized in the table to the right.

		Actual Demand	
		High	Low
Forecast	Good News	71	9
	Bad News	4	16

A) If a forecast is not purchased, find the profit maximizing quantity to sell if demand turns out to be high, the profit maximizing amount to sell if demand turns out to be low, and expected profit. (7 points)

$.75(20 - .5q_H) = 1.5$

$20 - .5q_H = 2$

$.5q_H = 18$

$q_H = 36$

$.25(16 - .5q_L) = 0$

$q_L = 32$

$E(\pi) = .75(20 - .25(36))36 + .25(16 - .25(32))32 - 1.5(36)$

B) Conditional on having received a forecast of low demand, find the profit maximizing quantity to sell if demand turns out to be high, the profit maximizing amount to sell if demand turns out to be low, and, expected profit. (7 points)

$.2(20 - .5q_H) = 1.5$

$20 - .5q_H = 7.5$

$.5q_H = 12.5$

$q_H = 25 < 32$, violates
constraint

$E(\pi) = .2(20 - .25q)q + .8(16 - .25q)q - 1.5q$

$\dfrac{dE(\pi)}{dq} = .2(20 - .5q) + .8(16 - .5q) - 1.5 = 0$

$4 + 12.8 - 1.5 = .5q$, $15.3 = .5q$, $q = 30.6$

$E(\pi | B) = .2(20 - .25(30.6))30.6 + .8(16 - .25(30.6))30.6 - 1.5(30.6)$

C) Let π_G stand for expected profit conditional on good news, π_B stand for expected profit conditional on bad news, and let π_N stand for expected profit if a forecast is not purchased. Using the probabilities given in the table above, write the expression for the value of a forecast. (Just use π_G, π_B, and π_N, not numbers.) (7 points)

$V = .8\pi_G + .2\pi_B - \pi_N$

D) Now, suppose there was a fixed cost of production that can be avoided if production is 0. Further, this fixed cost is higher than π_B (ignoring the fixed cost) and lower than π_N (ignoring the fixed cost). Would the forecast be more valuable, less valuable, or, of the same value as you found in part C? Why? (4 points)

More valuable, because you can shut down with a forecast of low demand, saving the fixed cost, thus increasing the difference between profits with and without the forecast.

FALL 2006 EXAM 2

SHORT ANSWER 2   UFID#_____KEY_____

A) Tina and Stacy engage sell slightly differentiated thingamajigs and engage in price competition. The initial demand for Tina's thingamajigs is given by $q_T = 10(1 + p_S - p_T)$ and the initial demand for Stacy's thingamajigs is given by $q_S = 10(1 + p_T - p_S)$. Both firm's face a constant per unit cost of production equal to $2. Write out the firms' profit functions and solve for the equilibrium prices. (8 points)

$$\pi_T = 10(1 + p_S - p_T)(p_T - 2) \quad \pi_T = 10(1 + p_T - p_S)(p_S - 2)$$

$$\frac{d\pi_T}{dp_T} = 10(1 + p_S + -2p_T + 2) = 0$$

$$3 + p_S - 2p_T = 0$$

$$p_T = 1.5 + .5p_S$$

$$p_T = p_S = 3 \text{ By symmetry.}$$

B) Draw the firm's reaction functions on the axes provided. Label Tina's reaction function R_{T0} and label Stacy's reaction function R_{S0}. Also, label the equilibrium price. (6 points)

C) Suppose an aggressive advertising campaign by Tina shifts the demand cures to $q_T = 10(1.25 + p_S - p_T)$ and $q_S = 10(.75 + p_T - p_S)$, respectively. Show the effect on the reaction functions in the figure (you don't need to solve for precise numbers, just show things moving in the right directions. Label Tina's new reaction function R_{T1} and label Stacy's new reaction function R_{S1}. Label the new equilibrium prices p_{T1}^e and p_{S1}^e. (6 points)

D) Generally, with several firms in an industry, are the incentives for advertising higher with differentiated products price competition or homogenous product quantity competition? Why? (5 points)
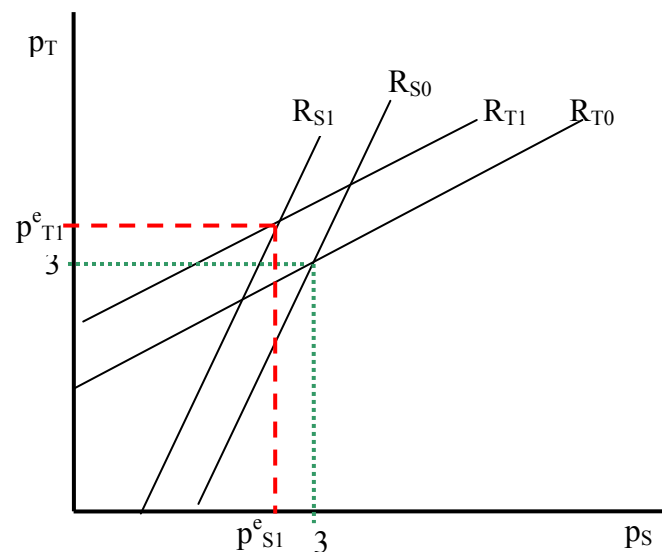
Differentiated. Because if all products are completely the same, all firms will share in increased sales when any firm increases advertising. Advertising can not allow charging a higher price if all products are completely identical.

SA Key 225

FALL 2006 EXAM 2

SHORT ANSWER 3   UFID#_____KEY_____

Alexie is now opening an operation in Small Town in
addition to her operation in Big City. Suppose all
potential managers for the Small Town operation have
the same utility function as one another. Their utility
depends upon consumption of housing (H), consumption
of other goods and services (O), and an amenity which is
specific to the city in which the manager lives (A), for
example the presence of a beach. The amenity value (A)
is higher in Big City than in Small Town, housing (H)
costs $20,000 per unit in Small Town and $25,000 per
unit in Big City, and other goods and services (O) cost $1
per unit in both Small Town and Big City. In Big City,
managers earn $100,000. Assume the manager's only
source of income is their salary.

The figure shows the indifference curve corresponding to
the utility level the managers would get in Big City, $\bar{U}_B$,
the budget line faced by the manager in Big City, and the
optimal choice of H and O in Big City, 2 and 50,000.

The indifference curve labeled $\bar{U}_S$ shows combinations of H and O in Small Town that would give the
same utility level as the manager would get in Big City.

A) Draw the budget line faced by a manager earning $100,000 in Small Town in the figure. (I suggest
    using a pencil or a calculator as a straight edge.) With this income, they can buy more of both H and
    O in Small Town than in Big City. Is a salary of $100,000 more or less than required to get them to
    accept a position in Small Town? Why? (12 points)

Less, because the lower housing price is not enough to compensate for the low amenity
level. (The managers can not reach utility level $\bar{U}$, indifference curve $\bar{U}_S$).

B) Draw the budget line that would correspond to the salary just high enough to get the manager to be
    indifferent between working in Big City and working in Small Town. Label the optimal choice of H
    and O in Small Town at this salary H$_S$ and O$_S$. (8 points)

C) Suppose the mangers' utility function is given by $U = \dfrac{HOA}{10000}$, and that A=1 in Small Town and
    A=1.8 (or, 9/5) in Big City. What is utility in Big City? Find the minimum salary needed to reach this
    level of utility in Small Town (indifference curve $\bar{U}_S$). (5 points)

$U_B = \dfrac{1.8 \cdot 2 \cdot 50000}{10000} = 18$

$H = \dfrac{M}{40000}, \quad O = \dfrac{M}{2}$

$\dfrac{MU_H}{p_H} = \dfrac{O}{(20000)10000} = \dfrac{H}{10000} = \dfrac{MU_O}{p_O}$

$U_S = \dfrac{1}{10000}\left(\dfrac{M}{40000}\right)\left(\dfrac{M}{2}\right) = \dfrac{M^2}{800000000} = 18$

$O = 20000H$

$M^2 = 14400000000$

$M = 20000H + 20000H = 40000H$

$M = 120000$

SA Key 226

FALL 2006 EXAM 2

SHORT ANSWER 4 (25 points)   UFID#_____KEY_____

Having sold their gadget venture, Ray and Will have now come up with a new and improved way to produce widgets! Working together, the value they can create is given by $V = 20\sqrt{e_R} + 25\sqrt{e_W}$, where e stands for effort. The cost of effort, the amount you would have to pay Ray and Will to induce them to willingly put forth that much effort, is given by e_R for Ray and $2e_W$ for Will, respectively.

A) Write the expression for joint surplus to be maximized if Ray and Will cooperate efficiently (the equivalent of the profit function in this case), and, solve for the efficient level of effort for Ray. (6 points)

$$S = 20\sqrt{e_R} + 25\sqrt{e_W} - e_R - 2e_W \qquad\qquad \sqrt{e_R} = 10$$
$$\frac{dS}{de_R} = \frac{10}{\sqrt{e_R}} - 1 = 0 \qquad\qquad\qquad e_R = 100$$

B) Assuming Ray and Will simply split the total value evenly and treat widgit production as a non-cooperative game, maximizing their individual surplus given the behavior they expect of the other, write the expression for Ray's individual surplus, and, solve for the level of effort he would choose to maximize it. (7 points)

$$S_R = \frac{20\sqrt{e_R} + 25\sqrt{e_W}}{2} - e_R \qquad\qquad \sqrt{e_R} = 5$$
$$\frac{dS_R}{de_R} = \frac{5}{\sqrt{e_R}} - 1 = 0 \qquad\qquad\qquad e_R = 2$$

C) How much net surplus does Ray's free riding cost the joint operation? (4 points)

$$Difference = (20\sqrt{100} - 100) - (20\sqrt{25} - 25) = 25$$

D) Why might no one enforce a contract between team members intended to alleviate free riding, and, why can selling the rights to profits generated from the widget venture to a group of stockholders mitigate that enforcement issue? (8 points)

If effort is unobservable, the only enforceable contract would punish all team members if output is below the level specified in the contract, not just the members that shirked. So, no team member would want to enforce the contract. (4 points)

Share holders have claim to all residual profits, so, they would not be hurt by enforcing punishment if output turns out to be below the level specified in the contract. (4 points)

FALL 2006 EXAM 2

SHORT ANSWER 5   UFID#____KEY____
Answer each of the following.

A) How does insurance create real economic value when people are risk averse? (8 Points)

By transferring a gamble from someone that is averse to risk, and therefore values it below the expected value, to a risk neutral insurance company that is willing to pay the full expected value for it because they have pooled a number of independent risks, thus eliminating much of the risk involved.

B) Why does adverse selection necessitate laws against insider trading in stock markets? (7 Points)

Insiders would only willing sell or buy stocks if they knew they were getting a bargain. Therefore, those without inside information will not be willing to sell or buy out of fear they are dealing with insiders. This can halt all trading, destroying the market.

C) Of the articles that have been posted on the discussion board, which two gave you the most insight into the course material? If you don't remember the name of the article, you can just say something like "the one on *whatever*", where *whatever* describes the main subject of the article sufficiently for us to figure out which one you are referring to. In what way did it help with which course concept(s)? There is no definite right or wrong answer here, but, whatever you say needs to make economic sense. (5 points each)

i)   2 points: name an actual article
        2 points: identify a concept actually pertaining to the article
        1 point: say something reasonable about how the article helped them
        understand the concept

ii)   2 points: name an actual article
        2 points: identify a concept actually pertaining to the article
        1 point: say something reasonable about how the article helped them
        understand the concept

SPRING 2007 EXAM 1

1. Product Development in the Gadget Market
A) Ali and Joel run the only two firms in the gadget industry. If Ali uses his firm's substantial R&D resources to introduce a vastly improved product and Joel does not change his product, Ali will make $200 and Joel will make $0. If Ali introduces the improved product line and Joel clones Ali's changes, Ali will make $100 and Joel will make $100. If neither make any changes, Ali will make $110 and Joel will make $60. If Ali does not make any improvements and Joel improves his product line on his own, Joel will make $40 while Ali will make $80. Draw the game tree and indicate the subgame perfect and the non-subgame perfect pure strategy Nash equilibria. (40%)

B) Suppose Ali will play games like this again and again, and that there are some "crazy" players who always punish competitors that clone improvements. They do so by selling goods below the cost of the firm that cloned those improvements, resulting in a loss of $100 for both firms. What is the smallest value of a reputation as a tough competitor that would lead Ali to punish Joel, if Ali is not "crazy"? How high must Joel believe the probability of being punished by Ali is in order to keep him from cloning? (15%)

$V_{Rep}-100 \geq 100$ $(1-prob)100-prob100 \leq 0$

$V_{Rep} \geq 200$ $100 \leq 200prob$

                                $0.5 \leq prob$

C) What happens to the value that Ali would place on maintaining a reputation as a tough competitor as he approaches retirement, and, why? (10%) <u>It declines, because the number of years over which higher profits can be collected due to the reputation declines.</u>

D) If there are no equilibria in which each player plays a particular strategy for certain, how do you find the Nash equilibrium? (15%) <u>By finding the mixed strategy equilibrium where each player chooses a probability of following each strategy. The probabilities are chosen to make the opponent indifferent between their strategies.</u>

E) Of the three articles posted on the class discussion board pertaining to game theory, which do you think is most applicable to this situation, and, briefly, why? (You need not give the title, just what it was about and how it pertains to this question.) (20%) <u>The TIVO article discusses first mover's improvements being adopted by second movers. Other articles: designated hitter, penalty kicks, poker. The DH article is the second most relevant, since it deals with punishment.</u>

SPRING 2007 EXAM 1

2. Minimizing Cost at Simona's Thingamabobs and Thingamajigs

A) Suppose Simona uses labor (L) and materials (M) to produce thingamajigs. At current production levels $MP_L=5$ and $MP_M=2$. The wage rate is \$10, and the price of materials is \$3. What can be done to reduce the cost of producing the same output level? Use the optimization condition for constrained cost minimization problems to explain why that would work. (30%)

<u>(5/10)<(2/3), so Simona gets more output from a dollar spent on materials at the margin. OR: (10/5)>(3/2), so it costs less to produce a marginal unit of output using more materials than using more labor. Therefore, she could reduce cost by using more material and less labor.</u>

B) Suppose Simona produces her thingamajigs in two plants, plant A and plant B. Cost in plant A is given by $C_A(q_A) = 100 + .1q_A^2$, where the \$100 fixed cost is sunk. Marginal cost in plant B is constant at \$10. There is no cost for starting up plant B. Since the marginal cost in plant A is \$0 if nothing is produced there, small amounts of output are optimally produced in plant A. Above what level of output does it become optimal to open plant B? Show your work, as just a number means you'll receive little credit. Briefly, in words, why is that the right quantity at which to open plant B? Also, how would your answer differ if there was some fixed start-up cost that would be incurred just for opening up plant B? (35%)

1) $MC_A=.2q_A=10=MC_B \rightarrow q_A=50$. Open B if q>50. 2) Marginal cost is less than \$10 as long as less than 50 are produced in plant A. But, MC>10 in plant A for any higher output levels. 3) Since the MC in A is only slightly over 10 if output is only slightly over 50, if there were a start up cost for plant B, you would wait until q was somewhat over 50 to open B so that the MC savings would overcome the start up cost.

C) A by-product of thingamajig production can be used to reduce the cost of producing thingamabobs. Using the by-product in this way reduces the cost of disposing of waste generated by thingamajig production. Suppose the constant marginal cost of producing thingamajigs alone is \$5 and the constant marginal cost of producing thingamabobs alone is \$4. Suppose that every thingamajig produced can reduce the marginal cost of a thingamabob by \$2, and every thingamabob produced can reduce the marginal cost of a thingamajig by \$1. The inverse demand for Simona's thingamajigs is given by $p_J = 10 - 0.5q_J$ and the inverse demand for Simona's thingamabobs is given by $p_B = 8 - 0.5q_B$ What quantities of thingamajigs and thingamabobs will maximize profit if Simona produces the two goods jointly? Why does this differ from the quantities that would maximize profits if the goods were produced independently of one another? (35%)

1) Possibility 1: $q_J > q_B$

$\pi = (10 - 0.5q_J)q_J + (8 - 0.5q_B)q_B - 5q_J - 4q_B + 3q_B$

$\pi_{q_J} = 10 - q_J - 5 = 0 \Rightarrow q_J = 5$

$\pi_{q_B} = 8 - q_B - 1 = 0 \Rightarrow q_B = 7$ NO

3) Possibility 3: $q_J = q_B = q$

$\pi = (10 - 0.5q)q + (8 - 0.5q)q - 6q$

$\pi_q = 10 - q + 8 - q - 6 = 0$

$12 = 2q$

$q_J = q_B = 6$

2) Possibility 2: $q_J < q_B$

$\pi = (10 - 0.5q_J)q_J + (8 - 0.5q_B)q_B - 5q_J - 4q_B + 3q_J$

$\pi_{q_J} = 10 - q_J - 2 = 0 \Rightarrow q_J = 8$

$\pi_{q_B} = 8 - q_B - 4 = 0 \Rightarrow q_B = 4$ NO

4) Since joint production lowers MC of at least one good, more of one or both goods must be produced to equate MR and MC.

SA Key 230

SPRING 2007 EXAM 1

3) Demand Approximation, Pricing, and Advertising at Brittney's Theatre
A) At a price of $6, Brittney was able to sell 600 tickets per night. After raising price to $8, she sold only 400. Using a linear demand approximation, what is the slope of the demand curve (not the inverse demand curve)? Also, using a log-linear demand approximation, what is the elasticity of demand? [FYI: ln(2/3)=-0.405, ln(1/2)=-0.693, ln(2)=0.693, and ln(4/3)=0.288] (25%)

$$\frac{\Delta q}{\Delta p} = \frac{400 - 600}{8 - 6} = -100 \qquad \frac{\Delta \ln(q)}{\Delta \ln(p)} = \frac{\ln(400/600)}{\ln(8/6)} = \frac{\ln(2/3)}{\ln(4/3)} = \frac{\ln(3/2)}{\ln(3/4)} = \frac{-.405}{.288} = -1.406$$

B) List 2 factors discussed in lecture that have great influence on the usefulness of a demand approximation for making decisions regarding production or pricing, and, explain why they matter. (25%)
<u>1) The number of observations. With few observations, how do you know if your approximation is usually accurate?</u>
<u>2) The range of the observations. You can't safely extrapolate beyond what you have observed.</u>
<u>3) Choosing the form that best fits the data. Don't use linear if demand is curved or log linear if demand is linear.</u>

C) Suppose Brittney is opening a theatre in a new town with a population of 80000. She has found that the fraction of the population in similar towns that purchase a ticket on Friday night can be approximated by $f = 0.1 - 0.01p$. The constant marginal cost of selling one more ticket is $2, and, the capacity of the new theatre is 2000 per night. What price maximizes profit on Friday night? (25%)

1) Possibility 1: q≤2000

$\pi = 80000(p-2)(0.1-0.01p)$

$\pi_p = 80000[0.1-0.02p+.02] = 0$

$0.12 = 0.02p$

$p = 6$

$q = 80000(0.1-0.01\times6) = 3200 > 2000 \quad NO$

2) Possibility 2: q=2000

$2000 = 80000(0.1-0.01p)$

$2/80 = 0.1-0.01p$

$p = [0.1-(1/40)]/0.01 = 7.50 ***$

D) Suppose in her theatre in Medium City, given a current advertising expense of $100 per day, the profit maximizing price and quantity are $8 and 1500 tickets per night, respectively, and the marginal cost per ticket is $3. She hires a consultant to report on the effectiveness of her advertising expenditures. The consultant reports that a 1% increase in advertising would raise sales by 0.02%. Assuming the consultant's estimate is accurate, how should Brittney change her advertising budget, and, why? (You are not expected to offer a specific numeric answer here.) (25%)

Increasing advertising 1% costs $1 and generates .0002*1500*(8-3)=$1.5 in revenue. So, she should increase advertising expenditures.

SPRING 2007 EXAM 1

4) Quantity Competition in the Widgit Market
A) Marianna and Lindsay have been run out of business by two new lean competitors, Jeff and Dan.
Dan's reaction function is $R_D(q_J) = 25 - 0.25q_J$, the market inverse demand is $p = 10 - 0.1Q$, and
Jeff's cost is $C_J(q_J) = 0.025q_J^2$. Assuming quantities are simultaneously chosen, write Jeff's profit
function, find his reaction function, and solve for each player's equilibrium quantity. (20%)

$\pi_J = (10 - 0.1(q_J + q_D)q_J - 0.025q_J^2$

$\pi'_J = 10 - 0.1q_D - .2q_J - 0.05q_J$

$10 - 0.1q_D = .25q_J$

$R_J(q_D) = 40 - 0.4q_D$

$q_J = 40 - 0.4(25 - .25q_J)$

$q_J = 40 - 10 + .1q_J$

$.9q_J = 30$

$q_J^e = 300/9 = 100/3$

$q_D^e = 25 - 0.25(100/3) = 50/3$

B) Now write Jeff's profit function and find each player's equilibrium quantity assuming Jeff chooses his
quantity first. (20%)

$\pi_J = (10 - 0.1q_J - .1(25 - 0.25q_J))q_J - 0.025q_J^2$

$\pi_J = (7.5 - 0.075q_J)q_J - 0.025q_J^2$

$\pi'_J = 7.5 - .2q_J = 0$

$q_J^e = 75/2 = 37.5$

$q_D^e = 25 - 0.25(75/2) = 125/8 = 15.625$

C) Now suppose Jeff and Dan will play this game an indefinite number of times, but there is chance that
each play will be the last. Cooperation may be sustained by grim trigger strategies if

$\left(\dfrac{1+r}{r+f}\right)\left(\pi_{coop} - \pi_{ne}\right) \geq \left(\pi_{cheat} - \pi_{ne}\right)$. What does each variable stand for? (20%)

r: <u>Interest Rate</u>
f: <u>Probability the game ends after each play</u>
π_{ne} : <u>Profit in the equilibrium of the one shot game.</u>
π_{coop} : <u>Profit if the player's cooperate</u>
π_{cheat} : <u>Profit if one player takes advantage of the other player's cooperation and maximizes their</u>
<u>own profit.</u>

D) How did we arrive at this inequality? You do not need to fully derive it mathematically, but explain
where it comes from. (20%)
By calculating the expected profit from cooperating to the end of the game against a grim trigger

strategy, $\pi_{coop} \sum\limits_{t=0}^{\infty}\left(\dfrac{1-f}{1+r}\right)^t$, and comparing it to the expected profit of cheating against a grim

trigger strategy, $\pi_{cheat} + \pi_{ne} \sum\limits_{t=0}^{\infty}\left(\dfrac{1-f}{1+r}\right)^t - \pi_{ne}$.

E) In the context of the quantity competition problem above, how would you find π_{coop} and π_{cheat}?
(20%)   To find π_{coop} , find the monopoly profit and divide it among the players. To find
π_{cheat} , maximize one player's profit assuming the other produces only their share of the
monopoly output.

SPRING 2007 EXAM 1

5) More on Market Structure
A) On the axes below and to the left, draw reaction functions for two firms, A and B, engaging in quantity competition. Label the equilibrium quantities q_{A1} and q_{B1}. (15%)

B) On the axes below and to the right, draw reaction functions for two firms, A and B, engaging in price competition with differentiated products. Label the equilibrium prices p_{A1} and p_{B1}. (15%)

C) In the model used in class to introduce differentiated product price competition, the relative desirability of each firm's product, from the viewpoint of a consumer, depended on the customer's location and on transport cost per unit distance to the firm. What types of things would customer location and transport cost represent when product differentiation is not geographic? (15%)
<u>Customer location, or distance, is the difference between products. Transport cost represents the cost to the consumer of switching to a less preferred product.</u>

D) Assume firm B invests in a technology to lower marginal cost. Show the effect this would have on the equilibrium under each type of competition in the figures above. Label the new equilibrium quantities q_{A2} and q_{B2} and the new equilibrium prices p_{A2} and p_{B2}. (15%)

E) All else equal, are incentives for cost reduction higher with quantity competition or price competition? Why? Relate your discussion to the graphs above. (20%)
<u>Quantity. With quantity competition, the strategic effect is to gain market share from your opponent, as shown. With price competition, the strategic effect is for your opponent to lower price, as shown, attenuating the loss of market share. Exception: when an opponent has no room to match price decreases.</u>

F) Describe a problem with using concentration measures such as the 4-Firm Concentration Ratio or the HHI to measure market power. Also, describe a problem with using measured mark-up to measure market power. (20%)

<u>Concentration measures don't measure behavior and have problems with market definition. Measured markup is difficult to implement because it is hard to properly measure marginal cost.</u>

SPRING 2007 EXAM 1

6) Equilibrium in the Gadget Industry
A) Currently, the typical firm in the gadget industry faces a firm level residual demand that can be closely approximated by $p = 4 - .1q$, and a long run cost function that is closely approximated by
$C(q) = 5 + 0.25q^2$. Describe what will happen in this industry in the long run, assuming there are no barriers to entry. (Explain why!) (35%)

$\pi = (4 - .1q)q - 5 - 0.25q^2$

$\pi' = 4 - .2q - 0.5q = 0$

$4 = .7q$

$q = 40/7 = 5.71$

$p = 4 - 4/7 = 24/7 = 3.43$

$AC = 35/40 + 400/49 = 2.3$

$\pi = 3.43 * 5.71 - 5 - 0.25 * 5.71^2 = 6.43$

Entry will occur, lowering price until economic profits are eliminated.

B) Assume now that each of the 25 firms in the gadget industry is a price taker and that market demand is given by $Q_D = 120 - 10p$. What is the short run equilibrium price? What will happen in the long run? Why? (35%)

1) Find firm Supply: $p = .5q$, $q = 2p$

2) Find market supply: $Q_s = 25q = 50p$

3) Set S=D and fine equilibrium price
$50p = 120 - 10p$

$60p = 120$

$p = 2$

4) Find firm's q and profit

$q = 4$

$\pi = 4 * 2 - 5 - .25 * 16 = -1$

Exit will occur, increasing price until profits are eliminated.

C) The owners of the 25 gadget firms from part B convince Congress that the short run equilibrium price from part B is too low to be fair. As a result, the US government pledges to buy and store as many gadgets as necessary to raise the equilibrium price by $2. How much does this cost taxpayers? How much does it increase industry profits? How much does it reduce consumer surplus? Illustrate the effect on each group in a supply and demand diagram drawn on the axes below. What happens to the tax cost of this program in the long run, and, why? (30%)

$Q_S = 50(4) = 200$

$Q_D(4) = 120 - 10(4) = 80$

$Q_D(2) = 120 - 10(2) = 100$

$TaxExpense = 4 * 120 = 480$

$q = 2 * 4 = 8$

$\pi = 8 * 4 - 5 - .25 * 64$

$\pi = 32 - 5 - 16 = 11$

$Xtra \, Profit = 25 * (11 - -1) = 300$

$LostCS = 2 * (20)/2 = 20 \quad PartA$

$LostCS = (4 - 2) * 80 = 160 \quad PartB$

The tax cost grows in the long run, because entry attracts more firms, increasing the quantity supplied at a price of $4, increasing how much the government must purchase to keep the price up.

SA Key 234
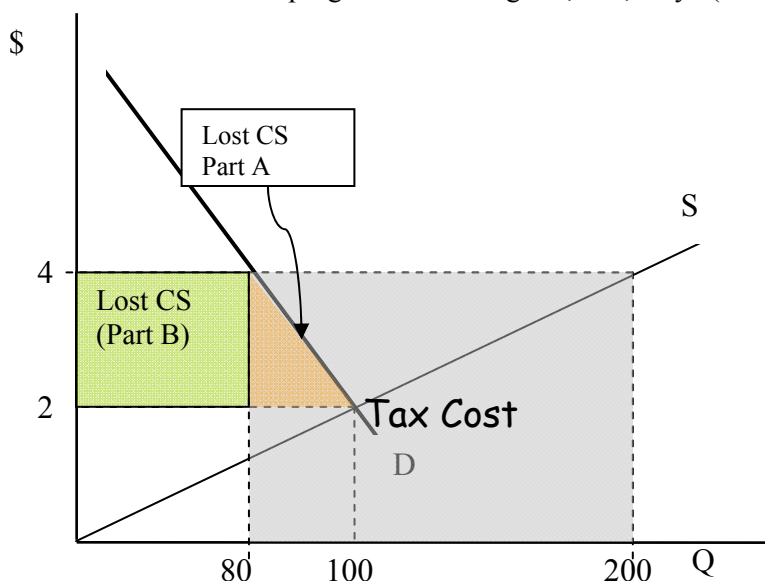
SPRING 2007 EXAM 2

1. Strategic Pricing. 6% Answer each of the following in the space provided.

A) If an upstream monopoly and downstream monopoly, that had been unable to cooperate in price setting, merge and determine output and pricing to maximize total profits, what happens to the final price faced by consumers? Why?

Final price falls because after the merger, $MR_D=MC_D+MC_U$, while before the merger, $MR_D=MC_D+p_U$, and, $p_U>MC_U$.

B) Why is credible commitment crucial to engaging in entry limit pricing? List 2 ways to so commit.

If an entrant anticipates that you will not actually produce a high output once they enter, threatening to do so will not keep them out. 1) Invest in technology to lower MC. 2) Invest in lowering MC by moving quickly along the learning curve. 3) Invest in a reputation as a tough competitor.

2. Cost. 10%
Simona had to build a new plant when plant A was wiped out in a Hurricane. Cost in plant C is given by $C_C(q_C)=100+.05q_C^2$, where the $100 fixed cost is a start up cost that can be avoided if the plant is not used. Marginal cost in plant B is still constant at $10, with no associated start up cost. At what (if any) output range is only plant B used? What about plant C? What about B and C together? Show your work, as just the final answer, even if correct, is little credit. Briefly, in words, why does the plant(s) in use change in this way with the total amount produced?

If q is low, it will be produced in B to avoid the start up cost in C, because the cost of 1 unit is $10 in B but is $100.05 in C. If C is started up, marginal cost in C is initially lower than MC in B. So once output is high enough to justify the fixed cost, production might switch to just C.

When does it become cheaper to switch to C? It takes at least 10 units for cost in B to reach just the fixed cost in C. And, at 11 units, cost in B is 110 and cost in C is $100+.05\times11^2=106.05$. So, for more than 10 units, output is produced in C only, at least until output becomes so large that MC in C exceeds the MC in B. (Setting cost in the 2 plants equal and solving with the quadratic formula gives 10.6 as the exact switch point. That is not required for full credit.)

When MC in plant C increases to equal that in B, B is opened again. Setting MC equal in the 2 plants: $.1q_c=10$, or q_C=100. So, once C is opened, 100 units will be produced there before anything is produced in B, and, anything over 100 will be produced in B.

Summarizing:
B only if q<11 / C only if 11<=q<=100 / B and C if q>100.

SA Key 235

SPRING 2007 EXAM 2

3. Perfect Competition. 12%
A) There are 50 identical perfectly competitive firms in the widget industry with cost functions given by $C(q)=10+0.5q^2$. This is both the short run and long run cost function. Demand is $Q_D = 400-30p$. What is the short run equilibrium price? What is the long run equilibrium price? How many firms will be in the industry in long run equilibrium? Show your work and explain!

i) First find supply.
    Firms set price equal to MC: p=q.
    There are 50 firms, so total quantity supplied is Q$_S$=50p.
2) Set supply and demand equal
    400-30p=50p
    solving gives p=5 for the short run price.
iii) Find the long run price
    The long run price occurs at the minimum LRAC, where MC=AC.
    This is because if price is higher (lower) firms enter (exit) driving price down (up) until
        profits (losses) are eliminated).
    Solving: q=10/q+0.5q, 0.5q²=10, q=20$^{0.5}$=4.47.
    Since p=MC=AC, and MC=q, that gives p=4.47.
iv) Find the number of firms
    At that price, quantity demanded is 400-30(20$^{0.5}$)=265.84.
    So it takes n=Q/q=265.84/4.47=59.44 firms.

B) Ranchers raising Blahbas face a minimum average cost of $5 per pound and minimum marginal cost of $2 per pound, and Blahba ranching is a perfectly competitive, constant cost, industry. Using the axes at right: i) draw the long run industry supply curve labeled LRIS, ii) label the long run equilibrium quantity Q$_0$, and iii) draw a short run supply curve through the long run equilibrium price and Q$_0$ and label it S$_0$. Suppose the government prevents more ranchers from entering and establishes a price floor of $6 by buying up any surplus at that price and dumping it in the ocean. Then: iv) label the new quantity purchased by consumers Q$_{DF}$, v) label the new quantity produced Q$_{SF}$, vi) indicate consumer surplus after the floor goes into effect by labeling the appropriate area CS$_F$ and marking it with scattered x marks, and vii) indicate the cost of the program to tax payers by labeling the appropriate area T$_F$ and marking it with scattered + marks.

SPRING 2007 EXAM 2

4. Econometrics. 12%
Medium Inc. regressed units sold monthly for 25 cities over 20 months on price, advertising, advertising squared, population (in thousands), and per capita income (in thousands). The results are shown in the table to the right.

A) Suppose Medium Inc is planning to open a new store in a town with a population (in thousands) of 100 and per capita income of $30 (thousand). Price and monthly advertising expenditures will be set at $10 and $1,000, respectively. Evaluate the usefulness of these results if the purpose is to provide a prediction of demand to determine the size of the new outlet. Assume that a prediction that is almost always within 5% (more or less) of the actual outcome is accurate enough for Medium Inc's planning purpose. (As part of your answer, construct an approximate 95% confidence interval for quantity.)

Variable	Coefficient	Standard Error
Price (Dollars)	-100	200
Advertising (Dollars)	-10	20
Advertising Squared	0.01	.75
Population (1000s)	20	4
Per Capita Income (1000s)	10	2
Constant	2500	75
Observations		500
F(5,494)		65
Probability > F		0.000
Root Mean Square Error (RMSE)		100

Predicted demand is 2500-100(10)-10(1000)+0.01(1000^2)+20(100)+10(30)=3800. So an approximate 95% CI is 3600 to 4000. Since 200 (2 X RMSE) is only 5.3% of 3800, the prediction seems reasonably accurate, relative to the goal of the firm. Overall, the model is statistically significant, based on the F-Stat. The population and income coefficients have the right sign and are significant (t-stats over 2). While the price coefficient has the right sign, it is not significant (t-stat = 0.5). The advertising signs are wrong, and, the t-stats are small. So, the model does not seem perfect, but, perhaps not too bad for purely predictive purposes.

B) Now evaluate the regression assuming its purpose is to generate parameter estimates to determine profit maximizing price and advertising. (As part of your answer, you should consider the t-statistics of the parameters.) Describe a possible source of omitted variables bias in the results. How might instrumental variables be used to mitigate the problem? What are some possible instruments? What is another way the bias could be addressed, and, why would it help?

The population and income coefficients have the right sign and are significant (t-stats over 2). While the price coefficient has the right sign, it is not significant (t-stat = 0.5). The advertising signs are wrong, and, the t-stats are small. So, there is no reason to have any confidence in these parameter estimates.

If price and advertising have themselves been chosen in response to the perceived demand level across months and cities, they will be correlated with the error in the demand equation, and the regression results are biased. Finding an instrument that was correlated with price and advertising, but not with the error term in demand, could allow Medium Inc to separate the effect of the error from the effects of advertising and price. Labor costs and business taxes may be correlated with price but not the demand error. The cost of advertising in each market may be an instrument for advertising.

Using panel data OR running conducting market trials by randomizing price and advertising and collecting more data could allow better estimation.

SPRING 2007 EXAM 2

5. Procurement Contracts and the Value of Information with Adverse Selection

A) Mike needs to procure custom thingamabobs. The value of the thingamabobs to Mike, before subtracting expenditures on the contract, is given by ln(q). There is a 0.5 probability cost will be $2 per unit and a 0.5 probability cost will be $5 per unit. Mike is negotiating with David to produce the thingamabobs. David will learn the true cost before actually producing the thingamabobs. Let P_H and q_H stand for the contract payment and quantity intended if cost turns out to be high and let P_L and q_L stand for the contract payment and quantity if cost turns out to be low. Set up Mike's full optimization problem, including both participation constraints and both truth-telling constraints. Which of the four constraints bind, which do not, and, briefly, why? You don't need to solve the problem, but, if you did solve it, you would find q_H is below the value equating the direct marginal cost of production to the marginal benefit to Mike. Why is this generally true in this type of problem?

$$Max_{P_L,P_H,q_L,q_H} \quad 0.5\left[\ln(q_L)-P_L\right]+0.5\left[\ln(q_H)-P_H\right]$$

$$subject\_to \quad \begin{aligned} P_H &\geq 5q_H \\ P_L &\geq 2q_L \\ P_H - 5q_H &\geq P_L - 5q_L \\ P_L - 2q_L &\geq P_H - 2q_H \end{aligned}$$

The first binds because there is no reason to pay a high cost producer more than their cost of production, but, you can't pay them less. The fourth binds because a low cost provider will be tempted to claim high costs unless he makes at least as much by admitting costs are low. Since he could do better than break even by claiming high cost, you can not force him to break even, the second constraint will not bind. Also, the third constraint does not bind because a high cost producer would never want to say cost is low. q_H is less than the level equating MB and MC to discourage a low cost producer from claiming high cost.

B) Mike can pay Jaime to undertake a study of the issues involved with production to narrow the range of uncertainty before negotiating the contract. Based on long familiarity with similar problems, Jamie tells Mike there is a 0.5 probability that the study will conclude that the probability of low cost is 0.8, and that otherwise her study will conclude the probability of low cost is only 0.2. How would the problem in part A change if Mike hires Jamie and her study returns good news? Letting π_{GN}, π_{BN}, and π_{NN} stand for expected profit if Mike hires Jamie and the study yields good news, if he hires her and the study yields bad news, and if he does not hire her, respectively, write an expression for the most Mike would be willing to pay for the study.

The only difference in the problem set up is that you would replace the probabilities without information with the probabilities relevant given the result of the study. The Value of the Information is $0.5\pi_{GN}+0.5\pi_{BN}-\pi_{NN}$.

SPRING 2007 EXAM 2

6. Uncertain Demand and Inventory. 12%

When Jeff produces whatchamacallits for shipment, he does not know if demand will be high or low. All he knows is that the probability of high demand is 0.6. If Jeff produces more than is sold, he can store it until next period at a cost of \$3 per unit. Inverse demand in a high demand period is $p_H = 80 - 0.4q_H$ and in a low demand period it is $p_L = 67 - 0.4q_L$. The constant marginal cost is \$18. **A)** Write out the complete maximization problem and find the optimal quantity to produce. Show all work. **B)** Describe the important steps in solving this kind of problem if storing unsold output were not possible but disposal is free. Then explain how the possibility of economically saving unsold goods changes the solution.

$$Max_{q_H, q_L} \quad E(\pi) = 0.6(80 - .04q_H)q_H + 0.4(67 - 0.4q_L)q_L - 18q_H + 0.4(18 - 3)(q_H - q_L)$$

$$subject\_to \quad q_H \geq q_L$$

$0.6(80 - 0.8q_H) = 18 - 6$	$0.4(67 - 0.8q_L) = 6$
$80 - 0.8q_H = 20$	$67 - 0.8q_L = 15$
$60 = 0.8q_H$	$52 = 0.8q_L$
$q_H = 75$	$q_L = 65$

75>65, so, the constraint is not violated.

Set up expected profit, allowing for the fact that if demand turns out to be low, everything produced need not be sold, and, production cost is determined by what is to be sold if demand is high. If the solution calls for more to be sold at times of low demand than is produced, the problem must be worked building in the constraint that this is not possible. If inventory is economical, you simply build in that if demand turns out to be low, some output will be saved. This will save the MC next period on each unit, less the cost of storage. This increases the amount to be produced, and, lowers the amount sold if demand is low.

SPRING 2007 EXAM 2

7. Consumer Theory

Big Inc. wants to transfer Diana from Steel, an inland industrial city, to Beach, a coastal city with miles of beautiful sandy beaches. Diana is making $100,000 in Steel. She spends $50,000 on 3.5 units of housing (H) and $50,000 on other stuff (O), obtaining the utility level corresponding to the indifference curve labeled $\overline{U}_{Steel}$ in the figure. Since Diana likes the beach, she could achieve the same utility level with less O and H in Beach at any point on the indifference curve labeled $\overline{U}_{Beach}$. The cost of housing in Beach is $20,000 per unit. The cost of other stuff in both Beach and Steel is $1 per unit.

A) Draw the budget line Diana would face in Beach at a Salary of $100,000, and label it BL$_1$. Then draw the budget line that would make Diana just as happy in Beach as she was in Steel, and label it BL$_{MIN}$. What salary level in Beach gets her to that utility level?

$80,000 (Or whatever the income corresponding to your budget line was if you did not draw it quite right.)

B) At the consumer's optimal bundle, where the budget line is just tangent to the highest possible indifference curve, the marginal rate of substitution (MRS$_{HO}$) equals the price ratio (p_H/p_O). Explain in words why a bundle that does not satisfy this condition is not the best choice. (You can use another version of the optimization condition if you prefer.)

If a consumer is willing to give up more (less) housing for a unit of other stuff than it costs to change one for the other in the market, they would be happier buying more (less) other stuff and less (more) housing. You could also argue the same thing in terms of marginal utility per dollar.

SA Key 240

SPRING 2007 EXAM 2

8. Expected Utility and Insurance

1000 identical individuals have preferences over monetary gambles represented by the expected value of the utility function $u = w^{.5}$, where w is the individual's wealth. Suppose initial wealth is $100, but each individual faces a 20% chance of losing $75.

A) What is the expected value of the gamble in monetary terms?

E(w)=0.8(100)+0.2(25)=80+5=85.

B) What is the certainty equivalent of the gamble?

$CE^{0.5}$=0.8($100^{0.5}$)+0.2($25^{0.5}$)= 0.8(10)+0.2(5)=8+1=9
CE=81

C) Assume: i) the individuals' risks are independent, ii) the insurance industry is perfectly competitive, and iii) the cost of administering a policy, including a fair return to the insurance company is $1. Then, what price would be charged for an insurance policy and what is the total economic value created by the insurance industry?

The insurance company must cover expected losses and administrative costs. Expected losses are 0.2(75) per individual, or $15. Thus the price that must be charged to break even is $16 per policy. Wealth with insurance is then $84, which is $3 above the CE. So, the value of the insurance industry is 1000X$3, or $3000. You could also find this by using:
Value=1000(EV-CE-Admin Costs).

SPRING 2007 EXAM 2

9. Other Decision Making Topics Answer each of the following in the space provided.

A) Suppose you are searching for the best deal on a new customized software program to manage production scheduling. You have found a deal that is reasonable, but not the best you think is out there. How do you decide whether or not to search again? Also, how does your decision as to whether or not to search again depend on whether or not the deal you have already found will be available after another search is made?

Compare the expected gains to the search cost. If the deal you have at hand will be lost, the expected gain must allow for the fact that you may end up worse off if you search again.

B) You are deciding whether or not to open a store in a new city. You can buy a consultant's report on the market's potential. If the report is favorable, the probability of success is much higher than if it is unfavorable. You know all the relevant probabilities. What are the 2 conditions to check first to determine if the value of buying the report is even greater than 0 before proceeding to calculate its value?

Will you proceed if the news is favorable? Will you not proceed if the news is not favorable?

C) What lesson can be drawn from the Allais and Ellsberg paradoxes? What about the fact that the endowment effect appears to disappear with experienced decision makers?

The Ellsberg and Allais paradoxes illustrate that individual decision makers do not always act in accordance with the model of expected utility maximization. (Specifically, the Allais paradox demonstrated that the independence assumption may not hold, and, the Ellsberg paradox demonstrated that individuals do not always form consistent subjective probabilities. Did not need this level of detail for full credit.)

On the other hand, the fact that the endowment effect disappears with sophisticated decision makers suggests that models based on rational decision makers may be a quite reasonable approximation for major decisions in markets with enough experienced traders.

SPRING 2007 EXAM 2

10. Incentive Contracts and Firm Structure - Answer all of the following in the space provided.

A) When designing incentive contracts to motivate effort in the presence of moral hazard, there is a trade off between risk and incentives. Why?

Individuals are risk averse. But, to motivate effort, pay must be contingent upon outcomes. Noise in the relationship between effort and introduces risk in the individual's contract. To induce the individual to accept the contract, it must pay more on average if it is riskier. But, to induce more effort, it must introduce more risk. Thus, the trade off.

B) Generally, how can relationship specific investment lead to inefficient product development?

Relationship specific investments are not valuable outside the relationship. The possibility that one party may try to exploit the sunk nature of such investments, by not recompensing the investing party appropriately, leads the party making them to under invest.

C) What is the root cause of free riding in team production situations?

Individuals only get 1/n of the marginal benefits of their work (if there are n team members who share the value produced equally) but bear the full disutility of their own effort. So, rather than setting the marginal benefit of effort equal to the marginal cost, every individual has an incentive to under provide effort, free riding on the efforts of the others.

D) When contracts that might alleviate hold-up or free riding are difficult to enforce through the legal system, how can selling shares to stockholders to serve as residual claimants and hiring a manager with a reputation as an honest arbiter of internal disputes (and an interest in maintaining it) reduce those problems?

The residual claimants have an incentive to enforce whatever contracts are feasible.

If everyone believes the manager can observe effort and trusts him to honestly reward it, they will be willing to exert effort.

Fall 2007 EXAM 1

Short Answer 1. Simple One Shot Games.

Suppose Tolu and John are the only producers of Thingamajigs, and their products are nearly identical. They each have access to a technological improvement, the introduction of which will introduce product differentiation. Due to the accident of the geographic locations of their operations, the improvement will work slightly better for John than for Tolu. If John implements the change and Tolu does not, the expected value of future profits is $11 for John and $6 for Tolu. If John does not implement the change and Tolu does, John's profit is $8 and Tolu's is $9. If neither implements the improvement, the expected value of profits is $10 each. If both do so, expected profits are $6 for John and $4 for Tolu.

A) Draw the normal form for this game assuming John and Tolu play this as a one shot simultaneous move game. What is (are) the Nash equilibrium (equilibria)? Draw the normal form for this game. (7 points)

		John	
		⟨Implement⟩	No
Tolu	Implement	T: 4, J: 6	T: 9, J: 8*
	No	T: 6*, J: 11*	T: 10, J: 10

N.E.

B) Suppose instead that Tolu moves first. Now what is the sub-game perfect Nash equilibrium? (Draw the game tree.) (7 points)
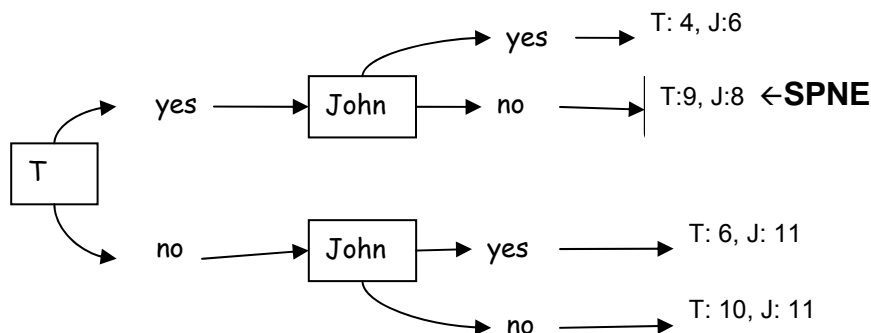
C) How might Tolu cultivating a reputation as an aggressive competitor have similar effects on the outcome of the strategic interaction between Tolu and John in a simultaneous move game as when Tolu moves first? (6 points)

If John <u>believes</u> Tolu will implement the change no matter what, he will choose not to. Just as when he actually <u>observes</u> Tolu implement the change <u>before</u> making his choice.

SA Key 244

Fall 2007 EXAM 1

Short Answer 2. Demand Approximation.

Diana operates a lunch buffet. At a price of $7, she averages 100 customers per day. When she runs a sale price of $5, 120 customers purchase over the same time period. The unit cost of serving a customer is constant at $3 and capacity is not limited.

A) What is the linear approximation of the demand curve? (5 points)

$$\frac{\Delta q}{\Delta p} = \frac{20}{-2} = -10$$

$$q = 100 - 10(P - 7) = 170 - 10P$$

$$\frac{\Delta q}{\Delta p} = .1$$

$$p = 7 - .1(q - 100) = 17 - .1q$$

B) Using that linear approximation, what is the profit maximizing price? (5 points)

$\Pi = (17 - .1q)q - 3q$ $\qquad$ p=17-.1(70)
$\quad$ 17 - .2q = 3 $\qquad\qquad$ =10
$\quad$ 14 = .2q
$\quad$ Q=70

C) Within the context of the problem (as opposed to broader concerns) is there any specific reason to feel confident about, or, doubt about, the estimated profit maximizing price? Explain what the reason is and why it inspires doubt or confidence. (5 points)

There is reason for doubt because $10 is far outside the observed range of prices.

D) How should the distinction between long run and short run demand bear on Diana's pricing decision? (5 points)

In the LR, demand is more sensitive to price. Raising prices to exploit SR price insensitivity may lead to a large loss of customers in the LR.

Fall 2007 EXAM 1

Short Answer 3. Cost Minimizing Production Process.

A. Write out and explain the meaning of one of the three versions of what was referred to as the "optimization condition" for constrained cost minimization. Then, use it to explain precisely how the cost minimizing production process changes in response to a decrease in the cost of capital if the two main inputs are capital and labor. (10 points)

$\frac{MP_i}{P_i}$ equal for all inputs. If one input gives more output per dollar at the margin, cost could be reduced by using more of it and less of other inputs. If capital becomes less expensive, "bang per buck" increases $\frac{MP_k}{r_k}$, so a more capital intensive production process should be used.

B. Suppose output is produced using labor (L) and capital (K) according to the production function $q = 0.5LK^2$. The price of labor is $100, and, the price of capital is $50. What amounts of capital and labor minimize the cost of producing 125 units? (10 points)

$MP_L = \frac{1}{2} K^2 \qquad MP_K$

$\frac{\frac{1}{2} k^2}{100} = \frac{LK}{50}$

$k = \left(\frac{200}{50}\right) L = 4L \qquad\qquad L = \frac{1}{4} K$

$125 = \frac{1}{2} L (4L)^2 \qquad\qquad 125 = \frac{1}{8} K^3$

$\qquad = \frac{1}{2} L^3 16 = 8L^3 \qquad K^3 = 1000$

$L = \left(\frac{125}{8}\right)^{\frac{1}{3}} = \frac{5}{2} = 2.5 \qquad L = 2.5$

$K = 4 \times 2.5 = 10 \qquad\qquad K = 10$

SA Key 246

Fall 2007 EXAM 1

Short Answer 4. Multi-Product Cost and Profit Maximization.

Ashley produces widgets at a constant unit cost of $7. She could use a by product of widget production to produce mini-widgets at a cost of $2. Every mini-widget produced reduces the cost of widget production by $1 since Ashley does not have dispose of the byproduct. Ashley can not produce more mini-widgets than widgets. The inverse demand for Ashley's widgets is given by $p_w = 15 - 0.5q_w$ and the inverse demand for her mini-widgets is given by $p_m = 8 - 0.25q_m$. The (fixed) cost of adding the facilities needed to produce mini-widgets is $30.

A. If Ashley does not add mini-widget production, how many widgets maximize profit? (6 points)

$$\pi = \left(15 - \frac{q_w}{2}\right)q_w - 7q_w$$
$$15 - q_w - 7 = 0$$
$$q_w = 8$$

B. If Ashley adds mini-widget production, how many widgets and mini-widgets should she produce to maximize profit? (10 points)

if $q_w \gg q_m$
$$\pi = (15 - q_L/2)q_w + (8 - q_m/4)q_m - 7q_w - 2q_m + q_m$$
$$15 - q_w - 7 = 0 \qquad\qquad 8 - q_m/2 - 1 = 0$$
$$q_w = 8 \qquad\qquad\qquad q_m = 14 \qquad *NO!$$

if $q_w = q_m$
$$\pi = (15 - q/2)q + (8 - q/4)q - 8q$$
$$15 - q + 8 - \frac{q}{2} - 8 = 0$$
$$15 = \frac{3}{2}q$$
$$q = 10 \qquad **$$

C. Should Ashley invest in the facilities to add mini-widget production? (4 points)

π with π without   45>32 => YES!

$P_w = 10$ $P_w = 11$
$P_m = 5.5$ $\pi = (11 - 7)8$
$\pi = (15.5 - 8)10 - 30$ $= 4 \times 8 = 32$
$= 7.5 \times 10 - 30$
$= 75 - 30 = 45$

Fall 2007 EXAM 1

Short Answer 5. Homogenous Product Oligopoly.

Phillip and Lyna each acquired half of the dairy farms in the industry. The wholesale inverse demand for milk is given by $p = 10 - .002Q$. Phillip's cost is given by $C(q_P) = 1000 + q_P$. Lyna's cost structure is identical.

A) Assuming the two engage in simultaneous move quantity competition, what are the equilibrium market price and quantity? (9 points)

$$\pi = (10 - .002q_P - .002q_l)q_l - 1000 - q_l$$
$$10 - .002q_P - .004q_l - 1 = 0$$
symmetry => $q = .006q$
$$q = 1500$$
$$Q = 3000$$
$$p = 10 - .002(3000) = 4$$

B) If Phillip and Lyna each produced only half of the monopoly quantity, each would produce 1,125 units and make a profit of $4,062.50. Suppose that discount rate is 12%. Suppose further that there is a 20% chance that the department of justice may break them up into hundreds of small perfectly competitive firms that make no economic profit after any given year. Assume monitoring costs and noise are negligible. Can trigger strategies sustain implicit collusion in which each firm produces half of the monopoly output? Using notation from lecture, the present value of "cheating" against a grim trigger is $\left(\dfrac{1+r}{r+f}\right)\pi_{coop}$ and the present value of "cooperating" against a grim trigger strategy is

$$\pi_{cheat} + \left(\frac{1+r}{r+f}\right)\pi_{ne} - \pi_{ne} .\text{(7 points)}$$

$\pi\, ne = (4 - 1)1500 - 1000 = 3500$
$\pi\, ct = (10 - .002)(1125) - .002q\, ct)q\, ct - q\, ct - 1000$
$\qquad = (7.75 - .002q\, ct)q\, ct - q\, ct - 1000$
$\qquad 7.75 - .004q\, ct - 1 = 0$
$\qquad .004q = 6.75$
$\qquad q = 1687.5$
$\qquad Q = 2812.5$
$\qquad p = 3.375$
$\pi\, ct = 3.375 \times 1687.5 - 1000 = 4695.3$

$\left(\dfrac{1.12}{.32}\right)(4062.5 - 3500) > 4695.3 - 3500$

$\qquad\qquad 1968.75 > 1195.3$
$\qquad\qquad\qquad YES!$

C) What (generally) would happen to the ability to sustain cooperation if there were more players, and, why? (4 points)

Cooperation becomes harder to sustain because i) the individual gain to cooperating goes down, and ii) monitoring costs increase.

FALL 2007 EXAM 2:

1. Differentiated Product Price Competition vs Homogenous Product Quantity Competition.

A) As in the related questions in the multiple choice section, Susana and Tina are the only producers of uWidgets. Assuming they engage in simultaneous move price competition, draw their reaction functions in the set of axes to the right. They need only have the right general position and slopes need only have the right sign. **4 points**

B) Explain what a reaction function means in this context. Be sure to explain the sign (+/-) of the slope, and, why the reaction functions have that slope. **4 points**

A reaction function gives one players best response to any price chosen by the other player. It slopes up because the higher the prices of substitute products, the higher the profit maximizing price will be.

C) Susana is considering launching a new advertising campaign that will raise the level of demand she faces by attracting new customers and making existing ones less price sensitive. Describe in general how this would change the price for both Susana and Tina (you do not need to calculate these), assuming the demand for Tina's product remains the same. Show the effect in the figure above. What is wrong with the assumption that the demand for Tina's product remains the same? **4 points**

Susana will charge higher prices since demand for her product is higher. Tina charges a higher price in response. But, Susana's advertising is likely to take customers from Tina, lowering demand for Tina's product.

D) How would the reaction functions differ if the product were identical and the two firms engaged in simultaneous move quantity competition? Why? **4 points**

They would slope **DOWN** because the more one player produced, the **LOWER** residual demand would be for the other, and, therefore, the less they would produce.

E) Why are incentives for cost reduction stronger with identical products than with differentiated products? **4 points**

Product differentiation means a price reduction will take fewer customers from the opponent.

Fall 2007 EXAM 2

2. Supply and Demand and Measuring Market Power

Suppose the minimum long run marginal cost of a gallon of orange juice is $3 and the minimum long run average cost is $4. Suppose the Citrus industry is well approximated perfectly competition and long run constant cost.

A) Draw the long run industry supply curve in the figure at right. **4 points**

B) Suppose Citrus producers successfully lobby the government for a subsidy of $1 per gallon on the grounds that foreign competition is unfair. (The government pays the firms $1 beyond the market price for every gallon sold.) i) Calculate the cost of the program to taxpayers. ii) Calculate the change in consumer surplus. iii) Calculate the deadweight loss. iv) Mark the area corresponding to deadweight loss created by the subsidy with x's. v) Explain what a deadweight loss is. **10 points**

1) $1 × 30 = 30
2) $1 × 20 + 1/2 × $1 × (30-20)
    = 20 + 5 = 25
3) ½ (30-20)(4-3) = 5
4) See above
5) A wasted of resources created when additional output would be more valuable than its cost and is not produced, OR, when output with a value less than its cost is produced, DUE to market distortions.

C) Suppose a number of Citrus producers merge, causing the Herfindahl-Hirshman index (HHI) calculated over all U.S. Citrus producers to rise precipitously, drawing the scrutiny of the department of justice. Give two sound reasons the HHI may be misleading in this case, overstating concentration. Also, describe a way of measuring market power that may be better than the HHI, and, potential flaws with this alternative method. **6 points**

1) There are many substitutes. Perhaps all juices, or, even all drinks should be in the market.
2) There are foreign sources of competition.
3) Instead, market power could be measured by comparing a) price to marginal cost, or, b) firm to market demand elasticity.
4) a) market definition is still problematic.
   b) getting the needed data may be impossible
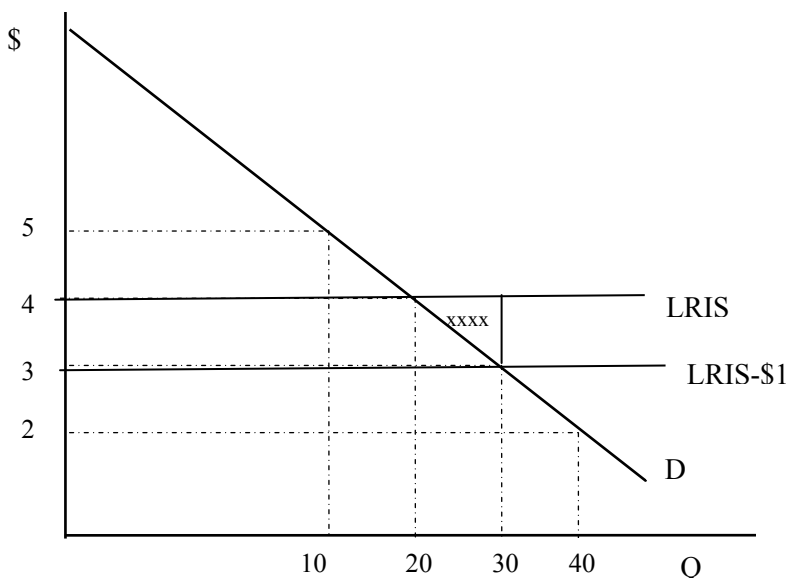
Fall 2007 EXAM 2

3. Utility Maximization and Compensation

Chris has an offer on the table that will pay him $5000 per month after taxes upon graduation to work in Lakeland, where rent is $1 per square foot. In Lakeland, his utility as a function of the size of his apartment (H) and the amount of money that he spends upon everything else (E) can be modeled by the function

$U(H,E) = 100 + 4H - 0.001H^2 + E$.

A) Write out an equation for and draw Chris' budget line. **4 points**

5000 = $1H + E
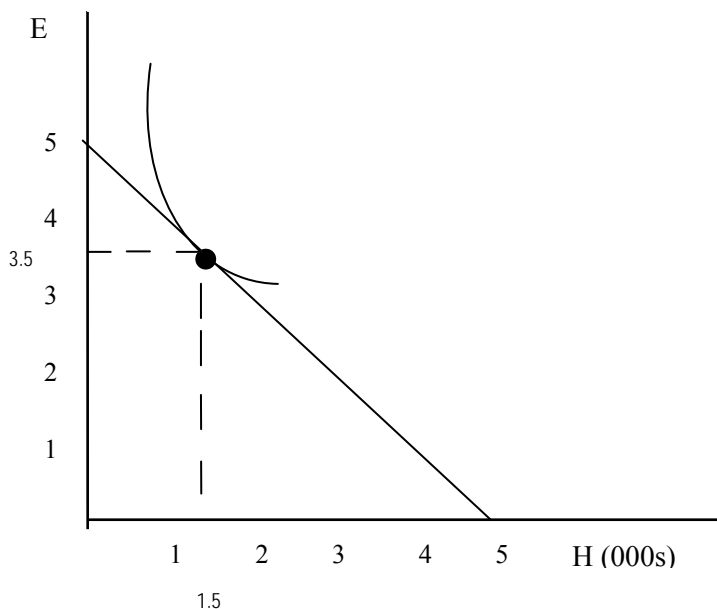
B) Find (calculate) Chris' optimal level of housing and expenditures on other stuff and indicate this point on your graph by drawing an indifference curve corresponding to where this optimum is achieved. The level of utility should come out to 7,350 with the optimal bundle. **10 points**

4 - .002H = 1   E=5000-1500=3500
3 = .002H
1500=H

U=4(1500)-.001(1500)+3500 + 100
=6000 – 2250 + 3500 +100 = $7350

C) Another company wants to entice Chris to move to Cincinnati. Chris finds the weather there less enjoyable, so, his utility is $U(H,E) = 4H - 0.001H^2 + E$ in Cincinnati (100 units less for any combination of H and E). Also, housing costs $2 per square foot in Cincinnati. Because of preferential tax treatment they receive from the city, the firm can offer Chris a 1400 square foot corporate owned apartment that would cost him $2,800 at an expense of only $2,700 to the firm. They are considering offering Chris a monthly salary of $3700 plus the free corporate housing, or, just offering him a salary of $6,400 per month, which costs them the same thing. Which would be more effective and why? (Because utility is higher or lower is NOT explanation of why. The question is, why one offer gives higher utility, when they cost the company the same thing.) **6 points**

1) Free housing   **2) W = 6400**   **E=6400-2(1000)**
U=4(1400)-.001(1400)²+3700   **4-.002H/2 = 1/1**   **=4,400**
=5600-1960+3700 = 7340   **2-.001H = 1   U=4(1000)-.001(1000)+4400**
                                 1 = .001H   =4000-1000+4400
                                 H* = 1000   =7400
                                                         Works

The cash offer is better because the apartment is too big to be optimal. Bang for buck is higher on E than on housing. This outweighs the effect of the reduced housing price.

Fall 2007 EXAM 2

4. Incentive Contracts and the Value of Information

A) Michelle wants to hire Morgan to manage her new restaurant chain. Morgan's utility function is $u(w) - d(e)$ where w is her income and d(e) is the disutility of effort expended on the job (that is, the cost of effort in terms of utility). If Morgan works hard, the probability the new chain will succeed is 0.6 and the disutility of effort is 10. If she does not work hard, the probability the new chain will succeed is 0.2 and the disutility of effort is 0. At her current job, Morgan's utility is 50. Write out the participation and incentive constraints that Michelle must meet if she wants to hire Morgan and motivate her to work hard, assuming effort is not observable and success or failure is the only signal on which to base an incentive contract. Let w_H stand for salary if the restaurant is successful and w_L stand for salary if the restaurant is not successful. Explain in words what each constraint means. **8 points**

1) 0.6U(WH) + 0.4U(WL) – 10 $\geq$ 50
2) 0.6U(WH) + 0.4U(WL) – 10 $\geq$ 0.2U(WH) + 0.8U(WL)

1) Morgan must be paid enough that she is willing to leave her current job. (Participation)
2) Morgan must gain enough expected utility from working hard to keep her from slacking.

B) Suppose Michelle is considering hiring Juan to conduct an analysis of the likelihood of success BEFORE hiring Morgan. Morgan and Michelle think that if Juan reports conditions are favorable, the probability of success if Morgan works hard is 0.8 and the probability of success if she does not work hard will still be only about 0.2. Compared to the case where Michelle does not commission Juan's report (part A), what would a finding of favorable conditions do to: 1) w_H, 2) w_L, and 3) the difference between expected compensation costs with the optimal incentive contract and compensation required to hire Morgan under certainty? Explain why. **6 points**

WH would decrease and WL would increase because the higher probability of WH means the incentive need not be as strong to get Morgan to work hard. This reduces Morgan's risk, so that the expected cost of her compensation will be smaller, closer to what it would be with certainty.

C) Michelle thinks the probability that Juan will find favorable conditions if he undertakes the study is 0.7. Let E(w|F) be expected cost of Morgan's compensation given a favorable report. Let E(w|N) be expected cost of Morgan's compensation if Michelle does not commission the report. Suppose Michelle would not proceed with the restaurant if Juan reports unfavorable conditions. Success means a profit of $100 and failure means a loss of $50 (a negative profit), before Morgan's compensation is subtracted. Write out an expression for the value of Juan's report (you must factor in the expected cost of Morgan's compensation package). **6 points**

.7[.8(100)+.2(-50)-E(w/F)]-[.6(100)+.4(-50)-E(w/N)]
.7[80-10-E(w/F)]-[60-20-E(w/N)]
.7[70-E(w/F)]- [40-E(w/N)]

  Any version above is fine

Fall 2007 EXAM 2
5. Insurance and Adverse Selection

A) 1,000 identical individuals with an initial wealth of $100 face a 0.2 probability that an accident will occur that reduces wealth by $75. All risks are independent. Each individual has a utility function given by $\sqrt{wealth}$.

i) If it costs $0.1 to write each policy, estimate the value created by insuring these 1,000 individuals. Show your work with everything clearly labeled. **5 points**

$$\sqrt{CE} = .8\sqrt{100} + .2\sqrt{25} \quad E(W) = .8(100) + .2(25)$$
$$= 8 + 1 = 9 \qquad\qquad\qquad = 85$$
$$CE = 81 \qquad\qquad V = 85 - 81 - 0.1)1000$$
$$\qquad\qquad\qquad = (3.9)1000 = \$3,900$$

ii) In words, how does insurance create value in this example? **5 points**
Pooling over many independent risks allows the insurance company to behave in an approximately risk neutral manner. Therefore, they require payment of only expected losses plus administrative costs to assume the risk. Since EW>CE for risk adverse individuals, this creates value.

B) Suppose Victor plans to make a take it or leave it contract offer to Emily, a public relations consultant, who he wants to hire to help smooth over hard feelings created by his choice of pricing strategy for his newly released uPhone. The value to Victor from improving his approval rating, A, is approximated by $V = 210A - 0.25A^2$. Emily's utility depends on her payment, P, and on how high she raises Victor's approval rating, and is given by $u = P^{0.5} - dA$, where d is the utility cost of raising the approval level one unit. If Amy stays in her current job, her utility will be 10. Victor does not know for sure how hard a task this will be, but, he knows there is a 0.4 probability that d equals 1 and a 0.6 probability d equals 4. Emily knows how hard the task will be, though. Victor wants to offer an optimal procurement contract that specifies a payment and approval level if the task is easy, (P_E, A_E), and, a payment and approval level if the task turns out to be hard, (P_H, A_H), so as to ensure Emily accepts the contract even if the task is hard but produces a higher approval rating if the task is easy.

Write the two binding constraints for Victor's optimization problem. Explain what each means and why each binds. **10 points**

1) $\sqrt{P_E} - A_E \geq 10$
2) $\sqrt{P_H} - 4A_H \geq 10$
3) $\sqrt{P_E} - A_E \geq \sqrt{P_H} - A_H$
4) $\sqrt{P_H} - 4A_H \geq \sqrt{P_E} - - 4A_H$

(2) and (3) bind. You need to pay enough for the lower approval rating (AH) that Emily will take the job even if it is hard. That is (2). It binds because Victor would never pay more than that, it just lowers profits to pay more. He must pay enough if it is easy to give Emily an incentive to provide AE, rather than slacking and providing AH. This is (3). It binds because he would never pay more than it takes to keep her honest.
(4) never binds, because no one would say a bad job is easy! (1) never binds because Emily could always lie if it is easy for a guaranteed gain.

FALL 2007 EXAM 3

1. Free Riding   UFID:_____

Mari and Jon enter into a joint venture in which they design software to help students master Managerial Economics. They will split proceeds from sales of the software equally. If both work hard, total proceeds will be $188. If neither works hard, total proceeds will be $28. If one works hard and the other does not, total proceeds will be $100. Both Mari's and Jon's utility functions are given by $u(\pi, e) = \sqrt{50 + \pi} - d$, where π is the individual's share of proceeds and d is the cost of effort in utility terms, or, the disutility of effort. The disutility of working hard is 4, and the disutility of not working hard (free riding) is 1.

A) Analyze this situation as a one shot non-cooperative game. Draw the normal (strategic) form of the game and clearly identify the Nash equilibrium. Hint: the payoffs should be in utility, not money.

Payoffs:

$Both\_Hard = \sqrt{50 + 188/2} - 4 = 8$

$Both\_Slack = \sqrt{50 + 28/2} - 1 = 7$

$Hard\_v\_Slack = \sqrt{50 + 100/2} - 4 = 6$

$Slack\_v\_Hard = \sqrt{50 + 100/2} - 1 = 9$

		Jon	
		Work Hard	Free Ride
Mari	Work Hard	M: 8 J: 8	M: 6 J: 9
	Free Ride	M: 9 J: 6	M: 7 ne J: 7 ne

B) Suppose that there are opportunities to punish partners that free ride, for example by giving them bad recommendations. There is no immediate economic reward to delivering such punishments but there are costs of delivering them in terms of time and effort. Mari has played games like this many times. She has always worked hard and has always gone out of her way to punish partners that free ride on her efforts. Jon is not concerned about his reputation. Let f be the probability with which John thinks Mari will work hard, let g be the probability with which he thinks Mari will punish him if he free rides, and let c be the cost to him in lost utility if he is punished. Write an inequality that determines if Jon will free ride and very briefly explain what it means. Name one very crucial factor he should consider in evaluating whether Mari will live up to her reputation and briefly explain why it matters.

Payoffs:

$Work\_Hard = f8 + (1 - f)6$

$Free\_Ride = f9 + (1 - f)7 - gc$

So, he will free ride if:

$f9 + (1 - f)7 - gc > f8 + (1 - f)6$

$f9 + 7 - f7 - f8 + f6 - 6 > gc$

$1 > gc$

i) Jon free rides if the expected utility of the monetary gain outweighs the expected cost of punishment. ii) Mari will be less likely to live up to her reputation if she will not be playing much longer, because the reward to doing so is smaller the shorter the number of plays remaining.

C) Briefly, what is the basic cause of free riding and why does it get worse with more partners?

Free riding occurs when a player bears the entire marginal cost of their effort but receives only a share of the marginal benefit, causing them to exert less effort than optimal from the group's perspective. With more partners, they will receive a SMALLER share of the benefits of their effort, and therefore will put forth less.

D) Briefly, how can forming a firm with outsiders as shareholders reduce free riding?

Partners in a joint venture may not enforce contracts to control free riding, since doing so would likely punish everyone, not just the free rider. Shareholders are residual claimants, giving them an incentive to ENFORCE contracts designed to reduce free riding, since they claim anything left over.

FALL 2007 EXAM 3

2. Peak Load Pricing   UFID:_____

A) The inverse demand for evening shows at Eric's cinema is given by $p_E = 9 - 0.04q_E$ (demand is $q_E = 225 - 25p_E$) and the inverse demand for matinee shows is given by $p_M = 9 - 0.05q_M$ (demand is $q_M = 180 - 20p_M$). The cost of admitting one more customer to a showing with seating available is $1. The cost of adding additional space (marginal capacity cost) is $2 per seat. Eric will charge a different price for matinee shows than for evening shows. Set up Eric's profit maximization problem and solve for the optimal capacity and also for the optimal prices for matinee and evening shows. Give a brief explain (in words) of what you are doing.

First, maximize profits assuming that there will be more evening shows than matinee shows, so that capacity is determined by the number of evening seats , only.
$$\pi = (9 - 0.04q_E)q_E + (9 - 0.05q_M)q_M - q_M - q_E - 2q_E$$
$$\partial\pi / \partial q_M = 9 - 0.1q_M - 1 = 0 \Rightarrow q_M = 80$$
$$\partial\pi / \partial q_E = 9 - 0.08q_E - 3 = 0 \Rightarrow q_E = 75$$
This violates the assumption behind the model. So now assume that capacity depends on both periods, so that seats sold for matinee and evening shows will be the same. The cost of 1 seat full for both shows is $4. So:
$$\pi = (9 - 0.04q)q + (9 - 0.05q)q - 4q$$
$$\partial\pi / \partial q = 9 - 0.8q + 9 - 0.1q - 4 = 0 \Rightarrow q = 77.78$$
$$p_E = 9 - 0.04(77.78) = 5.88$$
$$p_M = 9 - 0.05(77.78) = 5.11$$

B) Suppose that instead some customers view evening and matinee shows as substitutes, so that the inverse demand for evening shows is given by $p_E = 8 - 0.04q_E + 0.2p_M$ and the inverse demand for matinee shows is given by $p_M = 6 - .05q_M + 0.25p_E$. Set up Eric's profit function. You do not need to solve for the optimal capacity or prices. But, explain briefly how this difference would impact the optimal prices compared to the case when matinee and evening customers are completely distinct groups.

Assuming evening sales will be higher, profit will be:
$$\pi = (8 - 0.04q_E + 0.2p_M)q_E + (6 - 0.05q_M + 0.25p_E)q_M - q_M - q_E - 2q_E$$
If solving violates that assumption, profit will be:
$$\pi = (8 - 0.04q + 0.2p_M)q + (6 - 0.05q + 0.25p_E)q - 4q$$
Since raising price shifts demand to the other period, raising revenues at that time, prices tend to be higher. That tends to lower capacity. Capacity will also tend to be lower since capacity costs can be saved by shifting demand from peak to off peak times.

FALL 2007 EXAM 3

3. Econometrics

Andrew added beach umbrella rentals to his business and opened stands at 19 other locations. He regressed the number of rentals on price, population in thousands in the nearest nine city blocks (including tourists in hotel rooms), and, a dummy variable equal to 1 for weekend days and 0 otherwise. His data cover nearby populations from 2 to 12 (thousand) and prices from $3 to $7 over 3 years. Results are given in the table.

Variable	Coef.	Std. Err.	t	p-value
Price (Dollars)	-4	8	-0.50	0.617
Population (1000s)	8	4	2.00	0.046
Weekend	2	8	0.25	0.803
Constant	28	4	7.00	0.000
Observations			1095	
F(3,1091)			2.371	
Probability > F			0.069	
Root Mean Square Error (RMSE)			25	

A) Suppose he plans to open a new stand with a nearby population of 5 (in thousands) and charge $5. Write the equation for the demand curve and estimate weekend sales at the new location. Then, evaluate the usefulness of the regression for predicting weekend sales to determine capacity needed at the new location.

i) Demand:

$$Units\_Sold = 28 - 4\Pr ice + 8 Population + 2 Weekend$$

$$Units\_Sold = 28 - 4(5) + 8(5) + 2 = 20 - 20 + 40 + 2 = 50$$

ii) The group of variables is statistically related to sales, judged by the p-value of the F-Statistic. But, the standard error of the estimate, or, RMSE, is 25 units, so the 95% confidence interval on the prediction is 0 to 100. Since the RMSE is so large relative to the prediction, the estimate is not very useful for determining optimal capacity.

B) Evaluate the usefulness of the regression for generating estimates of demand curve parameters to be used to determine profit maximizing prices. For now, ignore the possibility of omitted variables bias.

i) The regression does not contain any variables that obviously should not be there.
ii) It does not include things like income, substitute prices, or rainfall, which it probably *should*.
iii) The coefficients have the right, or, expected sign.
iv) The price, population, and weekend coefficients are not statistically significant, judged by the p-values. Meaning there is no statistical evidence that these factors matter, when, we strongly suspect they should
v) The standard errors for each coefficient are very large relative to the coefficients. This means that the confidence intervals are very large. The approximate 95% confidence intervals for the price, population, and weekend coefficients are -20 to 12, 0 to 16, and -14 to 18, respectively. So, the parameters are not very useful for making profit maximizing decisions.

C) What is omitted variables bias, what are some likely sources of it in this example, and, how would it affect the usefulness of the parameter estimates?
Omitted variables bias occurs when a variable that *should* be included in the empirical model because it has a causal relation to the dependent variable is not included AND the omitted variable is correlated with variables that are included. This causes the estimated coefficients to be biased because they embody the effects of both the included variables and the omitted variable with which they are correlated.

FALL 2007 EXAM 3

4. Market Structure, Supply and Demand   **UFID:**_____

A) There are 11 firms in a homogenous product industry engaging in simultaneous quantity competition. Inverse demand is given by $p(Q) = 7 - 0.02Q$. In the Nash equilibrium, firms 1 thru 10 produce 25 units each. The 11th firm's cost function is given by $C(q) = 5 + q + .005q^2$. Write the 11th firm's profit maximization problem. How much does the 11th firm produce? What is the short run equilibrium price? What happens in the long run, and, why?

$\pi = (7 - 0.02(250) - 0.02q)q - q - .005q^2 - 5$

$d\pi / dq = 2 - .04q - 1 - .01q = 0$

$q = 20$

$p = 7 - .02(270) = 1.6$

$\pi = 1.6(20) - 20 - .005(20^2) - 5 = 5$

In the LR, profits will attract firms to the industry, increasing output and lowering price until profits are eliminated.

B) The figure below at left shows cost curves for a typical firm in a constant cost industry in which firms behave as price takers. The figure below at right shows market demand and the initial short run supply curve.

Typical Firm — $ vs Firm's Quantity (q); Average Cost, Marginal Cost.

Market — $ vs Market Quantity (Q, Hundreds); Initial Supply, LRIS, LRIS-2, Demand.
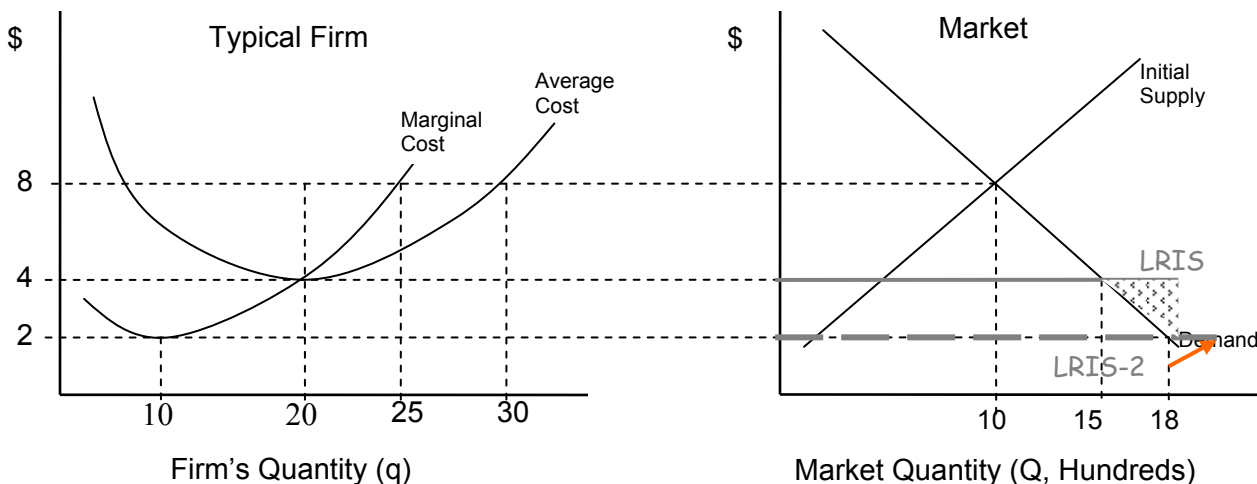
i) How many firms are initially in the industry?
At the initial price of $8, 1000 units are supplied/demanded. Each firm produces 25. 1000/25=40 firms.

ii) What is the long run equilibrium price?__4__
iii) Draw the long run industry supply curve in the figure, labeled LRIS.
iv) How many firms comprise the industry in the long run?
Quantity demanded at p=4 is 1500, and each firm produces 20. 1500/20=75 firms.

v) Show the impact of a $2 per unit subsidy in the long run in the figure.
vi) Mark the area corresponding to the deadweight loss with x's.
vii) How much taxpayer money does it take to fund the subsidy?
1800 units are purchased at the lower price of $2, so $3600.

SA Key 257

SPRING 2008 EXAM 1

Question 1. Product Innovation in the Thingamajig Market

Kristen is the largest producer of thingamajigs. German has a small part of the market. Both are considering introducing a new technology. If neither introduces the new technology, Kristen will make $7 and German will make $2. If both do so, they will incur the costs of product development and will also be in more direct competition with each other. As a result, Kristen make $5 and German will make $0. If German introduces the new technology and Kristen does not, he will gain many customers that were loyal to Kristen. In that case, German will make $3 and Kristen will make $4. If Kristen introduces the new technology and German does not, Kristen will make $6 and German will make $1.

A. Suppose lead time and market conditions are such that neither Kristen nor German know what the other is going to do when they make their decisions. Set up the normal form of the game in the space to the right. Find the mixed strategy equilibrium. In your work, let k be the probability that Kristen innovates and let g be the probability that German innovates. (5 points)

		German	
		Intro	Don't
Kristen	Intro	K: 5 G: 0	K: 6 G: 1
	Don't	K: 4 G: 3	K: 7 G: 2

Set expected payoff of introducing equal to expected payoff of not introducing.

For Kristen's payoffs:
$$5g + 6(1-g) = 4g + 7(1-g)$$
$$6 - g = 7 - 3g$$
$$2g = 1$$
$$g = 0.5$$

For German's payoffs:
$$0k + 3(1-k) = k + 2(1-k)$$
$$3 - 3k = 2 - k$$
$$1 = 2k$$
$$k = 0.5$$

SA Key 258

SPRING 2008 EXAM 1

Question 1. Product Innovation in the Thingamajig Market   (CONTINUED)

B. Suppose German has the lead in development and conditions are such that he must make his decision before Kristen, and that Kristen will know his choice when she makes her decision. Write out the game tree for this game and clearly indicate the roll-back or backward induction solution. (5 points)
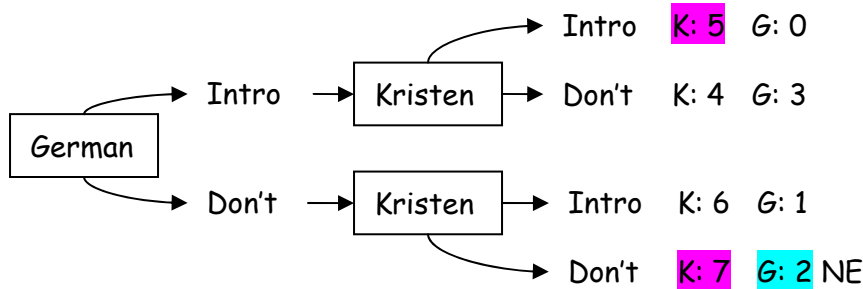
C. Suppose Kristen moves first. Write out the game tree and clearly indicate the backward induction solution. (5 points)

D. Now, suppose timing is such that either can choose to wait until after the other's move has been observed, but, if both wait until late in the market cycle, they move at the same time. Then, the timing of moves becomes part of the game too. Who moves first, and, why? (5 points)

If they play simultaneously, g=0.5 and k=0.5. Each of the 4 possible outcomes occurs with probability 0.25. So, Kristen's expected payoff is 0.25(5+6+4+7)=5.5, and, German's is 0.25(0+1+2+3)=1.5.

German prefers to go 1st, but, if he can't, he wants to simultaneously. So, he moves ASAP (Dominant strategy). Kristen prefers moving 2nd, but, prefers 1st to simultaneous. So, anticipating German will move ASAP, Kristen moves 2nd.

SPRING 2008 EXAM 1

Question 2. Repeated Games and Reputation Games
A. In a repeated game with no reputation effects, cooperation is possible if
$\left(\dfrac{1+r}{r+f}\right)\left(\pi_{cooperate} - \pi_{ne}\right) \geq \pi_{cheat} - \pi_{ne}$. Briefly describe how we arrived at this formula, what it means if the

inequality is satisfied, and, what is represented by i) $(1+r)/(r+f)$, ii) $\pi_{cooperate} - \pi_{ne}$, and iii) $\pi_{cheat} - \pi_{ne}$. (7 points)

The formula comes from comparing the expected present value of cooperating to the present value of defecting when the other player plays a grim trigger strategy.
Cooperation can emerge if the expected payoff of cooperating is higher th payoff of defecting.
i) $(1+r)/(r+f)$: captures the present value of future periods, including the discount rate, r, and the chance the game will end, f.
ii) $\pi_{cooperate} - \pi_{ne}$: is the difference between the per period profit cooperating and the per period profit in the nash equilibrium of the one shot game. This is the per period gain if cooperation is sustained.
iii) $\pi_{cheat} - \pi_{ne}$: is the difference between the per period profit if a player defects while his opponent cooperates and the per period profit in the nash equilibrium of the one shot game. This is one time gain from being able to take advantage of an opponent one time if they are playing grim trigger.

B. Why must a "reputation" be relatively expensive to earn and in order to be meaningful? (4 points)

If it is cheap to get a reputation, no one will believe you will make sacrifices to keep it, because, it would be cheap to get it back again. Hence, no one will believe that the risk of losing your reputation will change your behavior.

SA Key 260

SPRING 2008 EXAM 1

Question 3. Cost Minimization

A. Write out a version of the optimization condition for cost minimization and explain why it must be satisfied by the cost minimizing input combination. (5 points)

MRTS=Input Price Ratio
If one it takes less of one input to replace another in production than the rate they can be traded in the market, the extra can be saved, reducing costs.

OR

MP/Input Price equal for all inputs
If you get more output from a dollar spent on one input, you could save by spending more on that input and less on the others.

OR

Input Price/MP equal for all inputs
If you get another unit of output more cheaply with one input than the others, you can save money by using more of the first and less of the others.

B. Suppose Ed's firm develops a production process that allows producers to use more workers and less capital to produce any given output level than prevailing technologies. In what types of countries should Ed focus his marketing efforts? Explain why, making precise use of the optimization condition. (5 points)

He should focus on countries with high ratios of capital prices to labor prices. Since his technology economizes on capital usage by using more labor, firms where capital is expensive or labor is cheap will find it profitable to adopt his technology.

SPRING 2008 EXAM 2

Question 1. Competition or Cannibalization in the Thingamajig Market

Seitz is the only provider of thingamajigs. His research suggests there is a significant niche for a new type. Let Seitz' current product be type 1 and the potential new product be type 2. The inverse demand for type 1 is $p_1 = 15 - 0.2q_1 - 0.1q_2$, where the subscript denotes type. Inverse demand for type 2 is $p_2 = 15 - 0.2q_2 - 0.1q_1$. Both types cost $3 per unit to produce. If no one produces type 2, Seitz maximizes profits selling 30 units per period at a price of $9, making a profit of $180. SHOW ALL WORK IF YOU WANT CREDIT!!!!

A) Assuming a competitor introduces type 2, write Seitz' profit function and find the Nash equilibrium quantities and prices. Verify that Seitz' profit will be $115.2. (*10 points*)

$\pi = (15 - 0.2q_1 - 0.1q_2)q_1 - 3q_1$

$d\pi / dq_1 = 15 - 0.1q_2 - 0.4q_1 - 3 = 0$

$0.4q_1 = 12 - 0.1q_2$

$q_1 = 30 - 0.25q_2$

Using symmetry:

$q = 30 - 0.25q$

$1.25q = 30$

$q_1 = q_2 = 24$

$p_1 = 15 - 0.2(24) - 0.1(24) = 7.8$

$\pi = (7.8 - 3)24 = 115.2$

B) Assuming Seitz introduces type 2, write his profit function and find the quantities and prices that maximize profit. Verify that profit will be $240 (ignoring for now up front costs of development, etc…). (*10 points*)

$\pi = (15 - 0.2q_1 - 0.1q_2)q_1 - 3q_1 + (15 - 0.2q_2 - 0.1q_1)q_2 - 3q_2$

$d\pi / dq_1 = 15 - 0.1q_2 - 0.4q_1 - 3 - 0.1q_2 = 0$

$d\pi / dq_2 = 15 - 0.1q_1 - 0.4q_2 - 3 - 0.1q_1 = 0$

$0.4q_1 = 12 - 0.2q_2$

$q_1 = 30 - 0.5q_2$

Using symmetry:

$q = 30 - 0.5q$

$1.5q = 30$

$q_1 = q_2 = 20$

$p_1 = 15 - 0.2(20) - 0.1(20) = 9$

$p_2 = 9$

$\pi = (9 - 3)20 + (9 - 3)20 = 2 \cdot 6 \cdot 20 = 240$

SPRING 2008 EXAM 2

Question 1. Competition or Cannibalization in the Thingamajig Market (CONTINUED)

C) The up front cost to introduce type 2 is $175. Seitz is the market leader, so he has the first chance to fill the niche. If he does so, this year and next year he will be the only provider of each type. It is known that the market for both types will dry up after next year. If Seitz does not introduce type 2, if another firm does so, they will do so this year . Let f represent Seitz' belief about the probability another firm will introduce type 2 if he does not. What value of f makes Seitz indifferent between cannibalizing part of his current market versus simply hoping no one else enters? For simplicity, ignore the time value of money (assume r=0). (*10 points*)

$$\pi_{\text{int} ro} = E(\pi_{not})$$
$$240 + 240 - 175 = f(115.2 + 115.2) + (1 - f)(180 + 180)$$
$$305 = 230.4f + 360 - 360f$$
$$129.6f = 55$$
$$f = 0.424$$

*** 1 Bonus Point: Why is the assumption that no other firm will introduces type 2 in the second year if it was not introduced in the first year really a logical conclusion, not an assumption?

   With competition, profit is only 115.2 per period, which is less than the cost of introducing type 2. So, with only one year, it would not make sense to introduce type 2.

SPRING 2008 EXAM 2

Question 2. Price Supports in the Blahblah Market

The figure at right depicts supply and demand in the market for Blahblah meat. The long run industry supply curve is labeled LRIS and the short run supply curve at the initial long run equilibrium is labeled S_{SR}. The initial demand curve is D_1. Due to decreases in the prices of substitutes and reports that excess Blahblah consumption is unhealthy, demand falls to D_2. In response, Blahblah ranchers successfully lobby the federal government for a price support program to restore price to the original level (the equilibrium price BEFORE demand fell). The government keeps prices up by buying up as much Blahblah meat as necessary to support the price. SHOW ALL WORK IF YOU WANT CREDIT!!!!

A) Calculate the per-period values of:

The loss of consumer surplus in the short run due to the price support: (6-2)15+(6-2)(25-15)/2=80 (*1 point*)

The loss of consumer surplus in the long run due to the price support: (6-4)15+(6-4)(20-15)/2=35 (*1 point*)

The total cost (in tax dollars) to fund the price support: 6(30-15)=90 (1 *point*)

B) Mark the area corresponding to the loss of consumer surplus in the long run using vertical lines (|||||||). (*2 points*)

C) Mark the area corresponding to total tax dollars needed to support the price using horizontal lines (≡). (*3 points*)

*** Areas may overlap for B and C

D) Absent the price support, why is the decline in price larger in the short run than in the long run? (Something like "Because of the slopes of the SR and LR supply curves" is not an answer. Rather, why do the curves have that relation to one another and why does that impact the price?) (*6 points*)

In the long run, firms can enter and exit and adjust their plant size and other capital. These avenues to adjust quantity supplied are limited in the short run. Therefore, the fall in demand results in a larger price decline initially, as the firms absorb losses. As firms exit and scale down over time, price recovers somewhat.

E) What is a deadweight loss? (Don't try to calculate one, just describe what it is in words.) (*6 points*)

A deadweight loss occurs when the marginal cost of a good exceed its marginal social value, that is too many resources are devoted to production, or, when the marginal social value of a good exceed its marginal cost, that is too few resources are devoted to production. OR: A deadweight loss occurs when potential surplus is not realized due to some market imperfection.

SA Key 264

SPRING 2008 EXAM 3

Question 1: Demand Approximation and Econometrics

A) David sells gadgets. His sales are disproportionately to retired Caucasian women, and, are disproportionately strong in summer months. He wants to estimate a log linear demand approximation. That is $q = Ap^{\eta}$ or $\ln(q) = \ln(A) + \eta\ln(p)$ where η stands for the price elasticity of demand. At his normal price of $8 he sells 60 units per week. He runs a sale price of $4 and sells 240 units weekly. Based on these 2 data points, estimate the price elasticity of demand? (4 points)

Variable	Coef.	Std. Err.	t	p-value
ln(Price)	-4	1.25	-3.2	0.001
ln(Advertising)	-0.02	0.05	-0.4	0.689
ln(Population)	0.7	0.35	2	0.046
ln(Income)	0.6	0.75	0.8	0.424
Constant	-2	2	-1	0.317
Observations			2500	
F(5,2495)			28.8	
Probability > F			<0.000	
Root Mean Square Error (RMSE)			0.25	

$(240/60)=(4/8)^{\eta}$
$4=0.5^{\eta}$
$\eta=-2$

Parts B, C, and D
David collected more data over 100 weeks at locations in 25 different cities. The data included units sold, price charged, population, average income, and weekly advertising expenditures. He regressed the natural log of units sold on natural logs of the other variables. Prices and advertising levels are set for each location by the local manager. The data cover prices from $4 to $8, advertising from $200 to $400, population from 50,000 to 1,000,000, and per capita income from $30,000 to $ 45,000. Results are in the table at right.

B) If marginal cost is $3, calculate the profit maximizing price for the estimated elasticity and for the upper and lower limits of an approximate 95% confidence interval for the price elasticity. (4 points)

CI: -4±2.5, (-6.5,-1.5)
Low price: 3(-6.5/-5.5)=3.55
High price: 3(-1.5/-0.5)=9

C) Do the results seem sufficiently accurate to serve as a basis for estimating profit maximizing price and advertising levels? Why or why not? (Ignore for now arguments about omitted variables bias.) (6 points) *(I do not know:* O.*)*

No.
1) The standard error of the price coefficient is large. The confidence interval suggests the profit maximizing price puts the profit maximizing price between 3.55 and 9, a very wide margin of error.
2) The advertising coefficient is not statistically significant.
3) The income coefficient is not statistically significant, creating additional doubt about the results.

D) What is omitted variables bias and how might it have affected this regression? (Part of your answer should make specific use of information provided in the question.) (5 points) *(I do not know:* O.*)*

OVB occurs when a variable that has a causal relationship to the dependent variable is omitted from the regression and is correlated with explanatory variables included in the regression. It means the estimated coefficient is polluted, or biased, because it reflects not just the effect of the included variable, but, also, part of the effect of the correlated omitted variable. In this case, it was given that sales are retired white women and in summer, but, those variables are omitted. Since managers set price and advertising to maximize profit, price and advertising will clearly be correlated with the omitted variables.

SPRING 2008 EXAM 3

Question 2: Demand Uncertainty and the Value of Information

Your firm must produce output before knowing final demand. You know only that it might be either a high demand period or a low demand period. In a high demand period, inverse demand is $p_H = 18 - 0.25q_H$ In a low demand period, inverse demand is $p_L = 12 - 0.25q_L$. If you produce more than is sold, it is not economical to store output. The constant marginal cost per unit is $4. You have paid for a forecast of demand for the past 20 periods. Of those, 8 times the forecast was for high demand and demand was high, 2 times the forecast was for high demand but demand was low, 4 times the forecast was for low demand, but, demand was high, and, 6 times the forecast was for low demand and demand was low.

A) Estimate each of the following based the experience of the past 20 periods. (1 point each)

The probability of high demand, Pr(H): 12/20=0.6

The probability a forecast of high demand, Pr(GN): 10/20=0.5

The probability of high demand given high demand is forecast, Pr(H|GN): 8/10=0.8

The probability of high demand given low demand is forecast, Pr(H|BN): 4/10=0.4

B) Conditional on a forecast of low demand (bad news), find the profit maximizing quantity to plan to sell if demand turns out to be high and the profit maximizing amount to plan to sell if demand turns out to be low. (7 points)

$E(\pi \mid BN) = 0.4(18 - 0.25q_H)q_H$
$\qquad + 0.6(12 - 0.25q_L)q_L - 4q_H$

$\dfrac{\partial E(\pi \mid BN)}{\partial q_H} = 0.4(18 - 0.5q_H) - 4 = 0$

$18 - 0.5q_H = 10$

$0.5q_H = 8$

$q_H = 16$

$\dfrac{\partial E(\pi \mid BN)}{\partial q_L} = 0.6(12 - 0.5q_H) = 0$

$q_L = 24 > 16 = q_H$

Since the constraint is violated, the same quantity will be sold for high or low demand.
$E(\pi \mid BN) = 0.4(18 - 0.25q)q$
$\qquad + 0.6(12 - 0.25q)q - 4q$

$\dfrac{\partial E(\pi \mid BN)}{\partial q} = 0.4(18 - 0.5q)$

$\qquad + 0.6(12 - 0.5q) - 4 = 0$

$0.5q = 7.2 + 7.2 - 4$

$q = 20.8$

C) Let π_G stand for expected profit conditional on good news, π_B stand for expected profit conditional on bad news, and let π_N stand for expected profit if a forecast is not purchased. Using the probabilities given above, write the expression for the value of a forecast. (Just use π_G, π_B, and π_N, not numbers.) (4 points)

$Value = 0.5\pi_G + 0.5\pi_B - \pi_N$

D) Holding Pr(H), Pr(GN) and Pr(H|GN) constant, is the value of a forecast higher or lower if Pr(H|BN) is lower, and, why? (4 points) *(I do not know: O.)*

Higher, because the forecast is providing more accurate information about the likelihood of low demand.

SA Key 266

SPRING 2008 EXAM 3

Question 3: Consumer Theory
Anthony spends $12 on pizza and beer.
Initially the price of pizza is $2 per slice and
the price of a bottle of beer is $4, and he
buys 2 of each. The initial budget line and
consumption point (a) are depicted in the
figure at right. Now, suppose the price of
beer falls to $2 per bottle and the price of
pizza increases to $4 per slice.

A) Draw the new budget line in the figure. (2
points)

B) Draw the original indifference curve (one
that was just tangent to the original budget
line) in the figure. (2 points)

Pizza
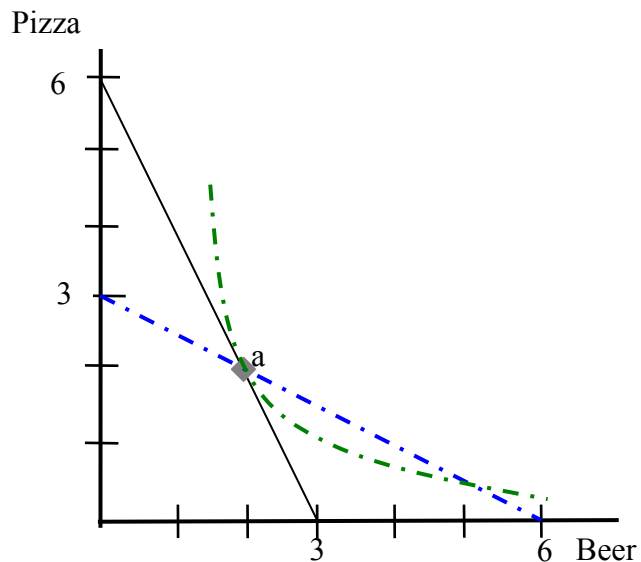
C) Use what we called the "optimization condition" in class (either version) to explain why point a is or is not the
optimal consumption bundle after the price change.
(4 points) *(I do not know: O.)*

Initially, at point a, $\dfrac{MU_{Beer}}{4} = \dfrac{MU_{Pizza}}{2}$. Therefore, $\dfrac{MU_{Beer}}{2} > \dfrac{MU_{Pizza}}{4}$ with the new prices at point a. Since
beer now gives more bang per buck than pizza, Anthony will buy more beer. OR:

At the initial prices at point a, $MRS_{B,P} = \dfrac{4}{2}$. So, at a with the new prices, $MRS_{B,P} > \dfrac{2}{4}$, he is now willing to
give up more pizza for another beer than the cost in the market place. So, he should buy more beer.

D) Is Anthony better off, worse off, or, just the same after the price change, and, why? (5 points) *(I do not know:
O.)*

He is better off. In the graph, he can get to a higher indifference curve. OR: Since the prices are different, he will
substitute beer for pizza. Since he could still buy the bundle at a, but, chooses a different one, he must be better
off.

E) Briefly describe two of the following: i) the endowment effect, ii) the Ellsberg Paradox, or iii) the Allais
Paradox. Your description need not have any mathematical detail. (6 points) *(I do not know: O.)*

i) The endowment effect refers to the possibility that people over value what they have, just because they have it.
This appears to be less of a problem for larger stakes decisions and for more experienced individuals.

ii) The Ellsberg paradox refers to an experiment in which people are shown either not to formulate consistent
subjective probabilities, or else, to exhibit an aversion to ambiguity in probability assessments.

iii) The Allais paradox is a scenario where people's choices appear to violate the independence axiom – changing
the part of a gamble that is the same in 2 options appears to change which option is chosen.

SPRING 2008 EXAM 3

Question 4: Expected Utility and Insurance

A) Suppose Dugan's utility function is $u = 1 - \dfrac{1}{w}$. His initial wealth is $100, but, there is a 0.1 probability that he will suffer a loss of $90. Find the certainty equivalent of Dugan's gamble. (6 points)

$$EU = 0.9\left(1 - \frac{1}{100}\right) + 0.1\left(1 - \frac{1}{10}\right)$$

$$EU = 0.9(0.99) + 0.1(0.9) = .981$$

$$\left(1 - \frac{1}{CE}\right) = 0.981$$

$$(1/CE) = 1 - 0.981 = 0.019$$

$$CE = (1/0.019) = 52.63$$

B) If there are 100 individuals facing the same gamble as Dugan (all are independent gambles) and administrative costs are $5 per policy, what is value added if everyone is fully insured? (5 points)

$$EV = 0.9 \times 100 + 0.1 \times 10 = 90 + 1 = 91$$

$$Value = 100(91 - 52.63 - 5) = 3337$$

C) How does risk pooling pertain to the value of insurance, and, what does that mean for the number of policies a homeowner's insurance company writes in one geographic area? (6 points) *(I do not know: O.)*

Pooling together many independent risks lowers the standard deviation of average wealth, via the law of large numbers. In essence, many independent gambles with large relative risk are replaced what is, in aggregate, a near certainty. That only works if the individual gambles are independent. Risks in one geographic location are not independent – a hurricane that damages one home will also tend to damage its neighbors. So, homeowner's insurance companies must not ensure too many homes in any one area, or, they will not be diversifying away risk.

SPRING 2008 EXAM 3

Question 5: Contracting with Moral Hazard
The setup is as follows:
- h) Mari wants to hire Jon to serve as her CFO.
- i) If Jon works hard, the probability of high profit is 0.8. If he does not, it is 0.3
- j) Jon's utility is $\sqrt{w} - d$, where w is Jon's payment and d is the utility cost of Jon's effort.
- k) If Jon's effort is high, the disutility is $d_H = 3$, otherwise it is $d_L = 0$.
- l) Mari wants to offer an optimal incentive contract that specifies a wage if profit is high, w_H, and, a wage if profit is low, w_L.
- m) Jon's next best job offer has $w = 625$ and $d = 0$.

A) Write the participation and incentive constraints. (5 points)

$$0.8\sqrt{w_H} + 0.2\sqrt{w_L} - 3 = \sqrt{625} = 25$$
$$0.8\sqrt{w_H} + 0.2\sqrt{w_L} - 3 = 0.3\sqrt{w_H} + 0.7\sqrt{w_L}$$

B) Solve for w_H, and, w_L. (3 points)

Rearranging the incentive constraint:

$$0.5\left(\sqrt{w_H} - \sqrt{w_L}\right) = 3$$
$$\sqrt{w_H} = \sqrt{w_L} + 6$$

Substituting into the participation constraint:

$$0.8\left(\sqrt{w_L} + 6\right) + 0.2\sqrt{w_L} = 28$$
$$\sqrt{w_L} + 4.8 = 28$$
$$\sqrt{w_L} = 23.2$$
$$w_L = (23.2)^2 = 538.24$$

Substituting into the second line above:

$$\sqrt{w_H} = 23.2 + 6 = 30$$
$$w_H = (29.2)^2 = 852.64$$

C) What does it mean to say there is a trade off between incentives and insurance in designing incentive contracts? (6 points) *(I do not know: O.)*

A larger bonus if profits are high, and a smaller base salary, provides more incentive for effort provision, but, also adds more risk into the agent's contract. Since people are risk averse, they must be paid more on average to accept a riskier contract. So, stronger incentives yield more effort, but, less insurance, which makes success more likely, but, increases compensation costs. The optimal incentive contract balances these factors.

D) What happens to the power of the incentives in such a contract (w_H - w_L) if the disutility of effort is higher? (4 points) Why, in words? *(I do not know: O.)*

If effort is more costly to the agent, the gain to working hard must be higher to overcome the disutility of effort. So, w_H increases and w_L decreases.

SPRING 2008 EXAM 3

Question 6: Contracting with Adverse Selection

The setup is as follows:

  i)   Ajay wants to hire Marti to improve customer satisfaction, *S*.
  j)   Ajay will make a single take it or leave it contract offer.
  k)   The total value of *S* to Ajay is *10S*, (or 10 per unit).
  l)   Marti's utility is $\sqrt{P} - dS$, where *P* is Marti's payment and *d* is the utility cost of "producing" *S*.
  m)   Both parties know there is a 0.25 probability the job will turn out to be "hard" (H), otherwise it is "easy" (E).
  n)   If the job is hard, the disutility to Marti is $d_H = 0.1$, otherwise it is $d_E = 0.05$.
  o)   Ajay wants to offer an optimal procurement contract that specifies a payment and satisfaction level if the task is easy, (P_E, S_E), and, a payment and satisfaction level if the task turns out to be hard, (P_H, S_H).
  p)   Marti will only sign the contract if her expected utility is higher than her reservation utility, which is 12, but, there are no liquidity constraints. So, there is only a single participation constraint in this problem.

A) Write out the single participation constraint. (3 points)

$$0.75\left(\sqrt{w_E} - 0.05S_E\right) + 0.25\left(\sqrt{w_H} - 0.1S_H\right) \geq 12$$

B) Write out the binding selection constraint. (3 points)

$$\sqrt{w_E} - 0.05S_E \geq \sqrt{w_H} - 0.05S_H$$

C) Explain the meaning of the binding selection constraint. (5 points) *(I do not know:* O.*)*

If the job turns out to be easy, the agent may be tempted to lie and say the job is hard to get a higher payment per unit produced. The selection constraint means the reward to being truthful and producing the larger amount must be high enough to overcome the incentive to lie.

D) Explain why the non-binding selection constraint does not bind. (5 points) *(I do not know:* O.*)*

If the job turns out to be hard, the agent will not be tempted to lie and say the job is easy, because that would result in a lower payment per unit produced, but, the cost per unit is high, so, they would be worse off if they lied, anyway.

SPRING 2008 EXAM 3

Question 7: Duopoly and Collusion

Mari and Lindsay are the only two providers of a homogenous product. Market inverse demand is $p = 20 - Q$. Each firm's constant marginal cost is \$2. If the two collude and act like a monopoly, each produces 4.5 units and makes \$40.5 in profit. If they engage in Cournot competition, each produces 6 units and makes \$36.

A) If the probability the game ends after any period is 0.2 and the interest rate is 0.1, is cooperation sustainable as a Nash equilibrium? (8 points)

$$\pi_{cheat} = (20 - 4.5 - q)q - 2q$$

$$\frac{d\pi_{cheat}}{dq} = 15.5 - 2q - 2 = 0$$

$$13.5 = 2q$$

$$q = 6.75$$

$$p = 20 - 4.5 - 6.75 = 8.75$$

$$\pi_{cheat} = (8.75 - 2)6.75 = 45.56$$

$$\left(\frac{1.1}{.3}\right)(40.5 - 36) \geq 45.56 - 36$$

$16.5 > 9.56$
So, yes, cooperation is sustainable.

B) Why does collusion become harder with more players? (4 points) *(I do not know: O.)*

1) Because the gains from cooperation are spread thinner (divided by more recipients).
2) Because it becomes more expensive to monitor compliance as there are more participants to monitor.

C) What happens in this market in the long run, and, why? (4 points) *(I do not know: O.)*

Firms enter, since profits are positive. Entry only stops when economic profits are eliminated.

SPRING 2008 EXAM 3

Question 8: Supply and Demand
The figure at right depicts long run supply and demand in the market for Blahblah meat. Suppose the government levies a tax of $2 per unit on Blahblah meat.
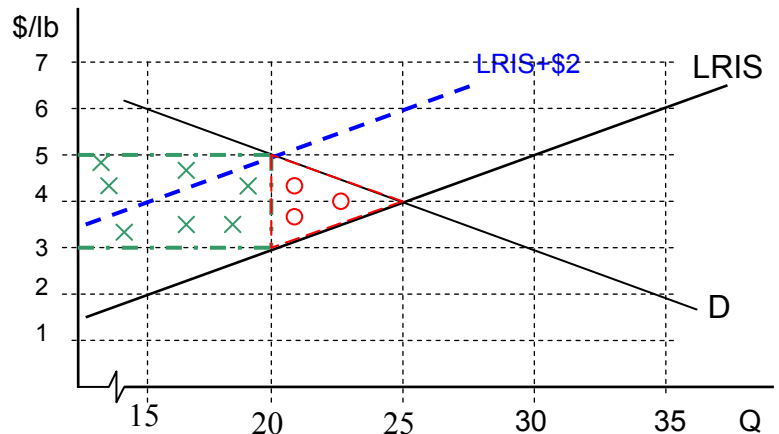
A) Show the after tax supply curve in the figure. (3 points)

B) What is the after tax price paid by consumers? $5 (1 point)

C) What is the after tax equilibrium quantity?

20 (1 point)

D) How much consumer surplus is lost? 22.5 (2 points)

(5-4)(20)+(5-4)(25-20)/2=22.5

E) How much producer surplus is lost? 22.5 (2 points)

(4-3)(20)+(4-3)(25-20)/2=22.5

F) How much tax revenue is raised? $2x20=$40 Mark the area in the figure with X's. (2points)

G) What is the deadweight loss? 2x(25-20)/2=5 Mark the area in the figure with O's (2 points)

H) What is the social cost per dollar of tax revenue raised by taxing Blahblah producers? What does this mean for benefit-cost analyses of government expenditures? (5 points) *(I do not know: O.)*

45/40=1.125. The benefits of a project must be 12.5% larger than the taxes expended to overcome the deadweight loss created by the tax.

SA Key 272

FALL 2008 EXAM 1 – SA KEY – Question 1

1A. Suppose the Gator football team faces 3rd and goal on the 4 yard line. They can line up initially with either a *Run* or *Pass* oriented offense. While they can make adjustments, the initial orientation influences their chance of success. Similarly, the defense can line up initially with either a run or pass orientation. Choices are simultaneous. The table at right represents this one shot game. The probability the Gators score is their payoff, and, the probability they do not score is the defense's payoff. (If you don't know much about college football, just treat it like any normal form game where the strategies are called Run and Pass).

1A		Defense	
		Run	*Pass*
Gator Offense	*Run*	G: 0.6 D: 0.4	G: 0.8 D: 0.2
	Pass	G: 0.7 D: 0.3	G: 0.6 D: 0.4

Question: Find the probability the Gators choose a run orientation, g_R, and the probability the defense chooses a run orientation, d_R, in the mixed strategy Nash equilibrium. (8 points)

$0.4g_R + 0.3(1 - g_R) = 0.2g_R + 0.4(1 - g_R)$

$0.3 + 0.1g_R = 0.4 - 0.2g_R$

$0.3g_R = 0.1$

$g_R = 1/3$

$0.6d_R + 0.8(1 - d_R) = 0.7g_R + 0.6(1 - d_R)$

$0.8 - 0.2d_R = 0.6 + 0.1d_R$

$0.3d_R = 0.2$

$d_R = 2/3$

1B. The next week the Gators play an opponent whose *Run* defense is as effective against the *Pass* as it is against the *Run* in short yardage situations (game at right). On College Game Day, Kirk Herbstreit and Lee Corso offer the following analyses.

1B		Defense	
		Run	*Pass*
Gator Offense	*Run*	G: 0.6 D: 0.4	G: 0.8 D: 0.2
	Pass	G: 0.6 D: 0.4	G: 0.4 D: 0.6

Herbstreit: Since the run defense is better against the pass, the Gators should *Run* more in short yardage situations than last week.

Corso: The Gators want to get their run matched against the defense in pass orientation - they score 8 of 10 times that happens. Since the run defense is relatively better against the pass this week, the Gators should *Pass* more in short yardage situations to get the defense to shift to a pass orientation sometimes, then, take advantage of that once in a while.

Question: Which analyst is right, and, why? (6 points)

Herbstreit is correct. It is now a weakly ___*dominant*___ strategy for the Gators to run. The only Nash equilibrium is a run offense and a run defense. If the Gators tried to convince the defense they were "crazy", they would have to pass a lot, and, would lose more than they would win (in terms of scoring chance) from that process.

2.   Armando and Gayle produce identical products and compete in quantities. Inverse demand is given by
     $p = 6 - 0.2Q$ and each firm's cost function is $C(q) = 0.1q^2$.

A.   Set up Armando's profit function, find his reaction function, and, find the Nash equilibrium quantities and
     price. (8 points)

$$\pi_A = (6 - 0.2(q_A + q_G))q_A - 0.1q_A^2 \qquad\qquad (4/3)q = 10$$
$$d\pi_A/dq_A = 6 - 0.2q_G - 0.4q_A - 0.2q_A = 0 \qquad q = 30/4 = 7.5$$
$$0.6q_A = 6 - 0.2q_G \qquad\qquad Q = 15$$
$$q_A = 10 - q_G/3 \qquad\qquad p = 6 - 15/5 = 3$$

Using symmetry:

B.   Graph and label the reaction functions on   the
     axes to the right (They need only have the   right
     general shape). Label the Nash equilibrium
     quantities q_{A1} and q_{G1}. (2 points)

C.   Suppose Armando adopts a new   Show
     technology that reduces his marginal cost.   just
     the change in the figure. (No calculations,
     the general effect.) Label the new Nash
     equilibrium quantities q_{A2} and q_{G2}. (2
     points)

D.   How would you determine the value of the
     marginal cost reduction? (The most
     Armando would pay to achieve it.) (2
     points)
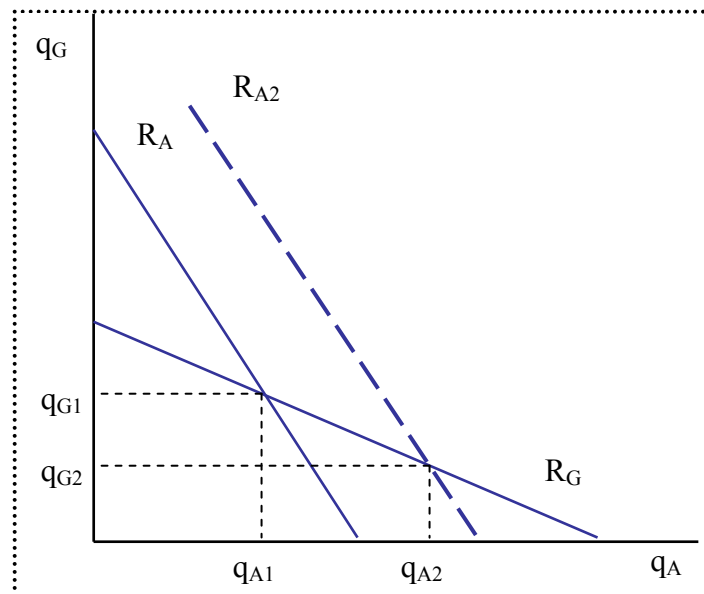
By comparing his profits in the Nash equilibria with and without the cost reduction.

E.   How is a unilateral reduction in marginal cost strategically similar to moving first? (4 points)
Both are a way to credibly commit to a higher output than Armando otherwise would have produced.

F.   Is this cost reduction worth more or less to Armando than it would be to a monopolist facing the same
     initial marginal revenue curve, and, why? (4 points)
More, because the decrease in the competition's quantity results in an increase in residual demand.

FALL 2008 EXAM 2 – SA KEY – Question 1

1. Alina is currently a local monopolist. Brittaney is considering entering the market next year and producing a slightly differentiated product. Lead times and capacity limitations are significant, so, the firms would engage in simultaneous quantity competition. If Brittaney entered, the inverse demand for Alina's product would be $p_A = 6 - 0.2q_A - 0.1q_B$ and the inverse demand for Brittaney's product would be $p_B = 6 - 0.2q_B - 0.1q_A$. Both firms face a constant per unit cost of $2 and fixed costs of $10.

A. Set up Brittaney's profit function and find the price of her product in the Nash equilibrium.

$\pi_B = (6 - 0.2q_B - 0.1q_A)q_B - 2q_B$

$\dfrac{d\pi_B}{dq_B} = 6 - 0.1q_A - 0.4q_B - 2 = 0$

$0.4q_B = 4 - 0.1q_A$

$q_B = 10 - 0.25q_A$

By symmetry, $q_B = q_A$, so:

$q = 10 - 0.25q$

$1.25q = 10$

$q = 8$

$p_B = 6 - 0.2(8) - 0.1(8) = 3.6$

B. Suppose Alina is able to convince the county government to charge all firms in her industry a fixed fee each period to go toward workforce development and downtown redevelopment, which would go into effect one period before Brittaney entered. i) How might this keep Brittaney out? ii) How would Alina decide it that strategy was worthwhile? iii) How large would the fee need to be to keep Brittaney out? (Explain i and ii in words and calculate iii.)

i) By reducing Britanney's profit to 0, or, slightly less, if she enters.

ii) By calculating how high the fee would have to be to keep Britanney out, then, comparing the present value of her profits with no fee and competition from Brittaney to the present value of her profits as a monopolist paying the fee every year.

iii) If Brittaney enters, ignoring the fee, her profit will be $\pi_B = (3.6 - 2)8 - 10 = 2.8$. So the fee would need to be at least 2.8 to keep her out.

C. If instead Alina considered engaging in entry limit pricing, what would she have to do to make that strategy effective, how might she go about doing it, and, how would she decide if it was worth it? Explain generally in words, no calculations.

i) To make the strategy effective, she would have to make a credible commitment to producing the higher quantity at a lower price whether Brittaney stays out or not.

ii) This could be done by reducing marginal cost through either investing up front in a production technology with high capacity and low marginal cost, or, perhaps by moving farther faster along the learning curve than would otherwise be optimal to make it so that it would never be optimal for Brittaney to catch up. Instead of reducing costs, she could invest in a reputation as a tough ("crazy") competitor in other markets.

iii) She would need to compare the expected present value of profits, with entry and without.

2. Jimmy is opening a new restaurant, and, must decide on his capacity level. Capacity costs $2 per unit and he faces an inverse demand of $p = 12 - 0.5q$. The problem is, he does not know what operating cost is going to be, only that it will be constant at either $2 or $4 per unit.

A. Assume Jimmy only knows there is a 0.4 probability that operating cost will be $2 per unit and that otherwise it will be $4 per unit. Carefully set up the problem for finding Jimmy's optimal capacity and then find it. Let q_L represent production when operating cost per unit is low and let q_H represent production when operating cost per unit is high. (Be careful, H means high cost, NOT high production!)

$$\pi = 0.4((12 - 0.5q_L)q_L - 2q_L)$$
$$+ 0.6((12 - 0.5q_H)q_H - 4q_H) - 2q_L$$

$$\frac{d\pi_H}{dq_H} = 0.6(12 - q_H - 4) = 0 \implies q_H = 8$$

$$\frac{d\pi_L}{dq_L} = 0.4(12 - q_L - 2) - 2 = 0$$

$$4.8 - 0.4q_L - 0.8 - 2 = 0$$

$$0.4q_L = 2 \implies q_L = 5$$

Since capacity is q_L, $q_L < q_H$ (5<8) is not possible. Since q_H is at most q_L, we must build $q_L = q_H$ into the problem.

$$\pi = (12 - 0.5q)q - 0.4(2q) - 0.6(4q) - 2q$$

$$\frac{d\pi}{dq} = 12 - q - 0.8 - 2.4 - 2 = 0$$

$$q = 6.8$$

B. Now assume Jimmy can hire Chris to prepare a report on the likely operating cost before choosing capacity. Chris tells him there is a 0.4 probability the report will at the report will find a 0.8 probability that operating cost will be cost $2, and that otherwise the report will find a 0.2 , probability that operating cost will be $2. Assume Jimmy agrees with Chris' judgments about the probable content of the report. Write an expression for the most he should willingly pay for the report. Rather than working out profit in all scenarios, just let π_G represent expected profit if Chris reports a high probability that cost will be low, π_B represent expected profit if Chris reports a low probability of low cost, and π_N represent expected profit if Jimmy does not hire Chris.

$$\text{Value} = 0.4\pi_G + 0.6\pi_B - \pi_N$$

C. Suppose that Jimmy has the option to put in place some capacity now and then to add additional capacity after learning the true operating cost. Later additions to capacity will cost $3 per unit, rather than $2. i) How would this change his decision about how much capacity to build today, and why? ii) What would this new option do to the value of Chris' report, and, why? No math required for i or ii, but be logical and concise in your explanation.

i) Depending on the exact values, he could build less capacity today and increase capacity later if operating cost was low. The would allow him to save capacity costs if operating cost is high, and, potentially, to produce more when operating cost is low.

ii) This would make the report less valuable. First, it would increase profit with no information. Second, the info might not change his action at all now. If the probability of low cost with a good report is high, Jimmy might choose to build capacity of q_L up front. But, if that probability is low, he may choose only to build capacity of q_H initially. If that happened, the information would have no value.

FALL 2008 Exam 3 – SA 1

A) $Q_{BEFORE}=1500-150(8)+10(200)-20(30)=1700$

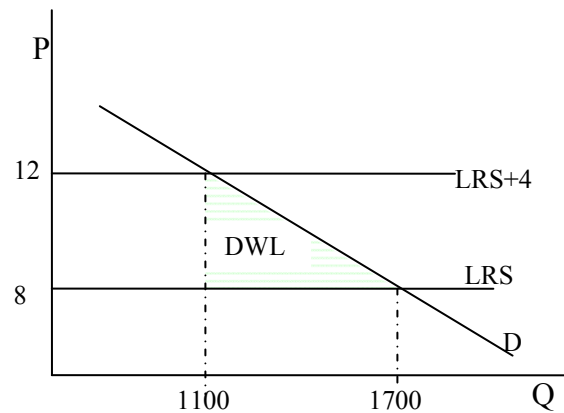$\Delta Q=-150(4)=-600$

$DWL=4\times600/2=1200$

B) Lower Limit $= -150-2(100)=-350$

$\Delta Q=-350(4)=-1400$

$DWL=4\times1400/2=2800$

C) <u>The standard error is large relative to the coefficient (or the t stat is only -20/25=-4/5, or the CI includes 0) so, statistically, there is little evidence or a relationship. Also, while inferior goods are possible, at the market level, they are rare. So, the negative sign may also raise doubts about the model.</u>

D) <u>OVB occurs when a variable that determines the independent variable is omitted from the model and is correlated with included explanatory variables. It is a problem because it makes it impossible to separate the effect of the explanatory variable and the omitted variable. Since price is determined in the market along with quantity, it is generally correlated with any omitted demand determinants. In this case, if the omitted demand determinants are correlated with drivers of minimum LRAC, the independent effect of price on quantity demanded can't be separated from the effects of correlated omitted variables.</u>

E) <u>Including city dummies would reduce OVB if the omitted variables are constant within cities over time. It would not if the omitted variables vary over time within cities.</u>

F) <u>**Natural Experiments**: find a major policy change or natural event outside the control of the market that caused changes in the explanatory variables not correlated with the independent variables. **Market Trial**: get the firms to temporarily randomly vary price across cities. **Instrumental Variables**: use variables included in supply but not in demand to identify changes in price that are not due to changes in the omitted variables.</u>

G) $a + bP + \varepsilon_D = c + dP + \varepsilon_S$

$(d-b)P = a-c-\varepsilon_S+\varepsilon_D$

$P = ((a-c-\varepsilon_S)/(d-b))+(\varepsilon_D/(d-b))$

So, a 1 unit increase in the demand error increases price by $1/(d-b)$.

SA Key 277

FALL 2008 Exam 3 – SA 2

A)
$$E(\pi) = f\left(10q_L - 0.05q_L^2 - P_L\right) + (1-f)\left(10q_H - 0.05q_H^2 - P_H\right)$$
$$= f\left(10q_L - 0.05q_L^2\right) + (1-f)\left(10q_H - 0.05q_H^2\right) - \left(f(P_L) + (1-f)(P_H)\right)$$

B)
$$f(P_L - 100 - 2q_L) + (1-f)(P_H - 400 - 4q_H) = 0$$
$$f(P_L) + (1-f)(P_H) = f(100 + 2q_L) + (1-f)(100 + 4q_H)$$

C) $P_L - 100 - 2q_L \geq P_H - 100 - 2q_H$

D) Substitute from B into A and differentiate

$$E(\pi) = f\left(10q_L - 0.05q_L^2\right) + (1-f)\left(10q_H - 0.05q_H^2\right)$$ Neither q depends on f here.
$$-f(100 + 2q_L) + (1-f)(400 + 4q_H)$$

Substitute the q's into B and C:
$$f(P_L) + (1-f)(P_H) = f(100 + 2(80))$$
$$+(1-f)(400 + 4(60))$$

$$\frac{\partial E(\pi)}{\partial q_L} = f(10 - 0.1q_L) - f(2) = 0$$

$$f(P_L) + (1-f)(P_H) = 640 - 380f$$

$$0.1q_L = 8$$
$$q_L = 80$$

$$P_L - 100 - 2(80) = P_H - 100 - 2(60)$$
$$P_L = P_H + 40$$

$$\frac{\partial E(\pi)}{\partial q_H} = (1-f)(10 - 0.1q_H) - (1-f)4 = 0$$

Substitute C into B
$$f(P_H + 40) + (1-f)(P_H) = 640 - 380f$$

$$0.1q_H = 6$$
$$q_H = 60$$

$$P_H = 640 - 420f$$
$$P_L = 680 - 420f$$

E) The selection constraint means the manufacturer must (weakly) prefer to produce the higher amount if cost turns out to be low rather than overstating cost. High cost producers would never be tempted understate costs.

F_i) q_L would not change, since it equates MB and MC in any case.

F_ii) q_H does not change. Since the participation constraint ONLY insures the agent breaks even on average, the agent may be kept honest by lowering P_H instead of reducing q_H.

F_iii) P_H declines, since the higher chance of low cost increases the agent's expected profit.

F_iv) P_L declines since it is easier to keep the manufacturer honest if cost turns out low (P_H declined) and since the increase in f increases the agent's expected profit.

G) In this case, the quantities do not change with f, so q_L would not equal 0, but both payments fall as f increases. In a case where q_L=0, zero, because they can't pretend costs are high.

H) You would hire Marianna if her information increases expected profit by more than the cost of hiring her. The more her report leads alters your probability assessments, the more it changes the contract offer, increasing expected profit and, making her information worth more

SPRING 2009 EXAM 1 SHORT ANSWER 1

A) <u>Purchases per thousand residents decrease by 0.01 units for every one dollar increase in price.</u>

B)
$$\widehat{q/N} = 0.49 - 0.01(60) + 0.005(41) = 0.095$$
$$CI: \ 0.095 \pm 0.08 \quad or \quad \left[0.015, 0.175\right]$$

C) <u>With population of 100, the predicted q is 9.5. The 95% CI ranges from 1.5 to 17.5. There is a very good chance of having more than 4 left or of running out if 9.5 are on hand. The results seem too imprecise for the purpose.</u>

D)

$$\pi = \left(0.49 + 0.005(42) - 0.01p\right)(p - 10)$$
$$\pi = 100\left(0.7 - 0.01p\right)(p - 10)$$
$$\frac{d\pi}{dp} = 100\left(0.7 - 0.01p - 0.01p + 0.01(10)\right) = 0$$

$$0.8 = 0.02p$$
$$p = 40$$
$$q = 100\left(0.7 - 0.01(40)\right) = 30$$

Since there is enough capacity, the optimal price is 40.

E) <u>1. There is no data from a city this size and income AND charging a price near this range. So, this is extrapolating too far for confidence. 2. The standard errors are relatively large for both the price and the income coefficients. Especially the high standard error on the price coefficient means that there is a lot of uncertainty about what the optimal price would actually be.</u>

SPRING 2009 EXAM 1 SHORT ANSWER 2

A) Point 'a' now costs:

4*8+5*4=32+20=52

(Same as original cost)
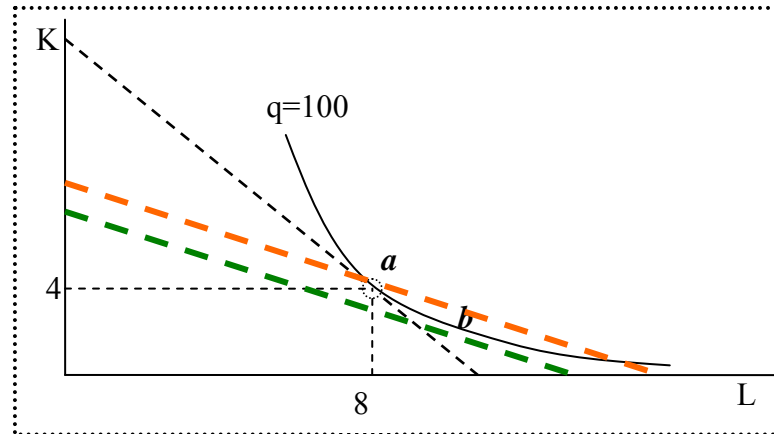
B) <u>Less. Point 'a' still costs the same amount. But, points to the right of 'a' on the isoquant would be on a lower isocost, thus, would cost less. Point b would now minimize cost.</u>

C) <u>More labor and less capital (as shown at point b). Since w fell and r increased, bang per buck increased for labor and fell for capital (could use MC using L and K or MRTS (MRTS is harder to explain)). So, more labor and less capital should be used.</u>

D) <u>It might. MC in plant B is lower than plant A at very low output levels (0.5 versus 2.0 at qB=0 and qA=0). If F is large and total Q is low, only A is used to avoid F. BUT, if F is low and total Q is low, all production may be in plant B to take advantage of the lower initial MC.</u>

$$MC_A = MC_B$$

E) $2 + 0.5q_A = 0.5 + 0.1q_B$

$$q_B = 15 + 5q_A$$

$39 = q_A + q_B$

$39 = 15 + 6q_A$

$q_A = 4$

$q_B = 35$

$C(A\&B) = 500 + 0.5(35) + 0.05(35^2)$

$+2(4) + 0.25(4^2) = 590.75$

$C(A) = 2(39) + 0.25(39^2) = 458.25$

$C(B) = 500 + 0.5(39) + 0.05(39^2) = 595.55$

It is cheapest to use A only, producing 0 in plant B

A)

Entrant — Enter → Molly — Acc → E: 2, M: 4

Molly — - - Fight - - → E: -1, M: 1

Entrant — Not Ent → E: 0, M: 8
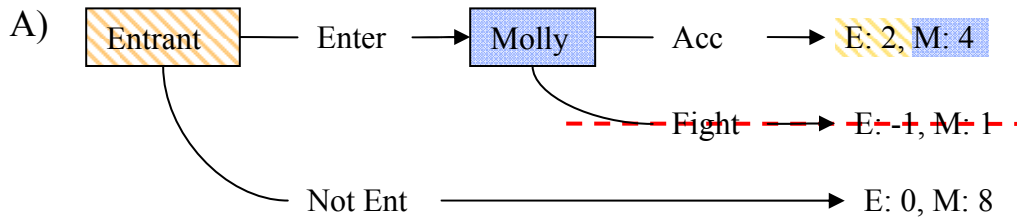
SPNE: Molly accommodates if the entrant enters, and, the entrant enters.

Non SPNE: Molly fights if the entrant enters, and, the entrant does not enter.

B) EPV(Fight)=EPV(Acc)

   $1+8Z=4+4Z$

   $4Z=3$

   $Z=3/4$

C) $E(\pi|Enter)= E(\pi|Not\ Ent)=$

   *Note: Molly fights for Z=2>3/4

   $y(2)+(1-y)(-1)=0$

   $3y=1$ $y=1/3$

D) Since fighting once keeps future entrants out, given the entrant's proposed strategy, Molly fights if Z=2>3/4. She will play a one shot game and accommodate if Z=0. If the probability of Z=0 is only 0.2<1/3, the entrant thinks the chance of a fight is too high, and, so, does not enter at t=0, given Molly's proposed strategy is to fight if entry occurs and Z=2. So, this is a Nash equilibrium of the repeated game.

E) A reputation is a way of committing to something other players would not otherwise believe a rational player would do – that is, of making threats and promises that would otherwise be empty credible. If the reputation was cheap to aquire, no one will believe the holder of the reputation will make sacrifices to keep it in tact, since it would be cheap to regain it later. Therefore, a reputation that is too easy to gain will not affect the behavior of other players, and, is worthless.

A) $MC=2q=p$ $S(p)=D(p)$

  $q=p/2$ $30p=800-$

$50p$

  $S(p)=60q=30p$ $80p=800$

  $S(p)=D(p)$ $p=10$

Graph showing p vs Q with curves LRIS(p), LRIS(1.1p), D(p), COST region (shaded), and DWL region. Price values 6.19, 6, 5.63 marked; quantity values 500, 519 marked.

B) $S(p)=D(p)$

  $100p-100=800-50p$

  $150p=900$

  $p=6$

  $Q=800-50(6)=500$
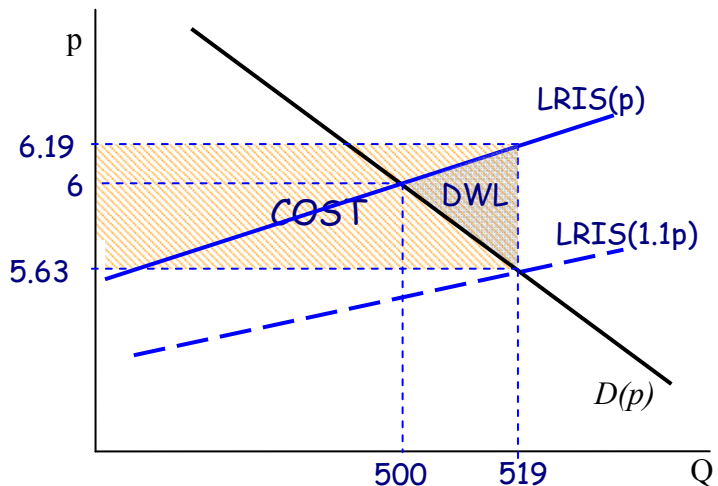
C) Profits attract more resources and firms to the industry, shifting the short run supply right, driving down price, until profits are eliminated.

D) $D(p)=S(1.1p)$ $Q=800-50(5.625)=518.75$

  $800-50p=110p-100$ $p_S=1.1(5.65)=6.1875$

  $160p=900$

  $p_D=5.625$

E) $Cost=0.1(5.625)(518.75)=291.797$

F) A DWL occurs when the marginal benefit is not equal to the marginal cost. Value added by that activity is then less than its maximum value, and the shortfall is referred to as a DWL. In this case, $DWL=(6.1875-5.625)(518.75-500)/2=5.27$.

G) As an ICI grows, factors of production that are best suited to that particular industry become more valuable. Competition among firms for the services of those factors drives up their prices. So, while the firms earn 0 economic profit in the long run, owners of those factors of production earn more than their opportunity cost.

A) $E(\pi) = 0.4\left(100\sqrt{q_L} - q_L\right) + 0.6\left(100\sqrt{q_H} - 3q_H\right) - 5q_L$

$\dfrac{\partial E(\pi)}{\partial q_L} = 0.4\left(\dfrac{50}{\sqrt{q_L}} - 1\right) - 5 = 0$

$50q_L^{-0.5} - 1 - 5/0.4 = 0$

$50q_L^{-0.5} = 13.5$

$q_L = (50/13.5)^2$

$\dfrac{\partial E(\pi)}{\partial q_H} = 0.6\left(\dfrac{50}{\sqrt{q_H}} - 3\right) = 0$

$50q_H^{-0.5} = 3$

$q_H = (50/3)^2$

$q_H > q_L$ Breaks assumption, must impose constraint and rework.

$E(\pi) = 100\sqrt{q} - \left(0.4(1) + 0.6(3) + 5\right)q = 100\sqrt{q} - 7.2q$

$\dfrac{\partial E(\pi)}{\partial q_L} = \dfrac{50}{\sqrt{q_L}} - 7.2 = 0$

$50q^{-0.5} = 7.2$

$q = (50/7.2)^2$

B) Pr(L|GN)=3/5, Pr(L|BN)=1/5, Pr(GN)=5/10

C) $E(\pi \mid Info) = 0.5\pi_G + 0.5\pi_B$, $Value = 0.5\pi_G + 0.5\pi_B - \pi_N$

D) With the option, she would build higher capacity, since she would want to sell more when the high cost is only $2 instead of $3. The report is less valuable with the option in hand, because the difference in desired capacity is smaller when operating cost only ranges from $1 to $2, so the information will result in a smaller change in the decision. The option is worth more if the report is unfavorable, since it is then more likely that the option will be exercised.

Write your UFID in the space provided. Don't write your name. Answer question 1 only in the space provided below. Points will be deducted if these instructions are not followed.

SPRING 2009 EXAM 3 SHORT ANSWER 2
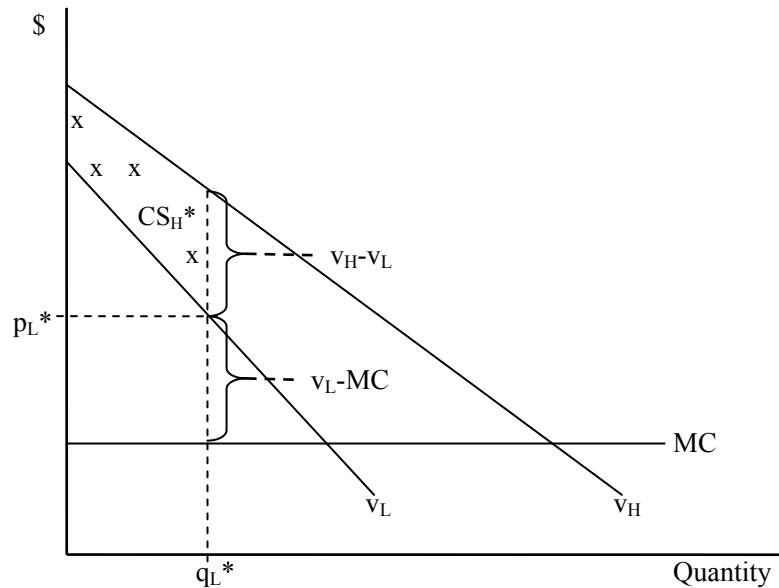
A) q_L* occurs where the marginal benefit of reducing q_L below the point where v_L=MC equals the marginal cost. The marginal cost is just v_L-MC as shown in the figure. The marginal benefit occurs because shrinking q_L makes it possible to extract a higher payment from the large consumer, and is equal to v_H-v_L. Thus, q_L is smaller than the level that maximizes value added to deter the large customer from choosing the small option.

B) The large customer can always get some CS by buying the option intended for the small type since they value the product more than the low type. Thus, they can never be charged a price that would result in CS=0.

D) The small customer type is never tempted to buy the large customer's option, so, there is nothing to be gained from making q_H differ from the level that would maximize value added.

SPRING 2009 EXAM 3 SHORT ANSWER 3

A) OVB occurs when an explanatory variable in a regression is correlated with the error term (an omitted variable). If price or advertising are correlated with an omitted variable, it will not be possible to disentangle changes in quantity due to changes in price or advertising from changes in quantity arising from changes in the omitted variables (error term). In this case, profit maximizing managers will adjust price and advertising in response to any demand shock, so, those variables will be correlated with the error term.

B) If the individual level idiosyncrasy that is correlated with explanatory variables is constant for each individual, including dummy variables will pick up those effects, or differencing will cancel them out. But, if those individual level factors are changing differently over time in a way that is related to changes in the explanatory variables, which is entirely possible, controlling for individual level fixed effects will not remove the OVB.

C) First, market trials are expensive because firms give up profits that could be earned based on their best guess about market conditions in exchange for the information gained from the experiment. Second, customers are not randomly assigned across markets, so, it is impossible to know for sure that the results are valid (unbiased) anyway. Third, market trials are not "double-blind". So, both customers and managers in different locations may adjust their behavior depending on the treatment they receive in the trial and what they expect to happen later, rendering the results invalid.

Fall 2009 Exam 1 Short Answer 1

A) $E(\pi) = \frac{3}{4}\left(400q_L^{0.5} - 5q_L\right) + \frac{1}{4}\left(400q_H^{0.5} - 10q_H\right) - 2q_L + \frac{1}{4}\left(q_L - q_H\right)$

B)

$\dfrac{\partial E(\pi)}{\partial q_L} = \dfrac{3}{4}\left(\dfrac{200}{q_L^{0.5}} - 5\right) - 2 + \dfrac{1}{4} = 0$

$\dfrac{\partial E(\pi)}{\partial q_L} = \dfrac{3}{4}\left(\dfrac{200}{q_L^{0.5}} - 5\right) - \dfrac{7}{4} = 0$

$\dfrac{\partial E(\pi)}{\partial q_L} = \dfrac{600}{q_L^{0.5}} - 15 - 7 = 0$

$q_L = \left(\dfrac{600}{22}\right)^2$

$\dfrac{\partial E(\pi)}{\partial q_H} = \dfrac{1}{4}\left(\dfrac{200}{q_H^{0.5}} - 10\right) - \dfrac{1}{4} = 0$

$\dfrac{\partial E(\pi)}{\partial q_H} = \dfrac{200}{q_H^{0.5}} - 10 - 1 = 0$

$q_H = \left(\dfrac{200}{11}\right)^2$

C) Capacity, q_L, would decrease, since the marginal cost of excess capacity when demand turns out low is now higher. The quantity to be sold if cost is high, q_H, would increase, as the marginal return to unused capacity is smaller.

D) The greater portion of the cost of excess capacity cost that can be recouped, the less valuable is additional information about the likely state of nature. That is because the loss due to building too much capacity is smaller, so the information will result in a smaller change in the decision.

Write your UFID in the space provided. Don't write your name. Answer question 2 only in the space provided below. Points will be deducted if these instructions are not followed.

Fall 2009 Exam 1 Short Answer 1
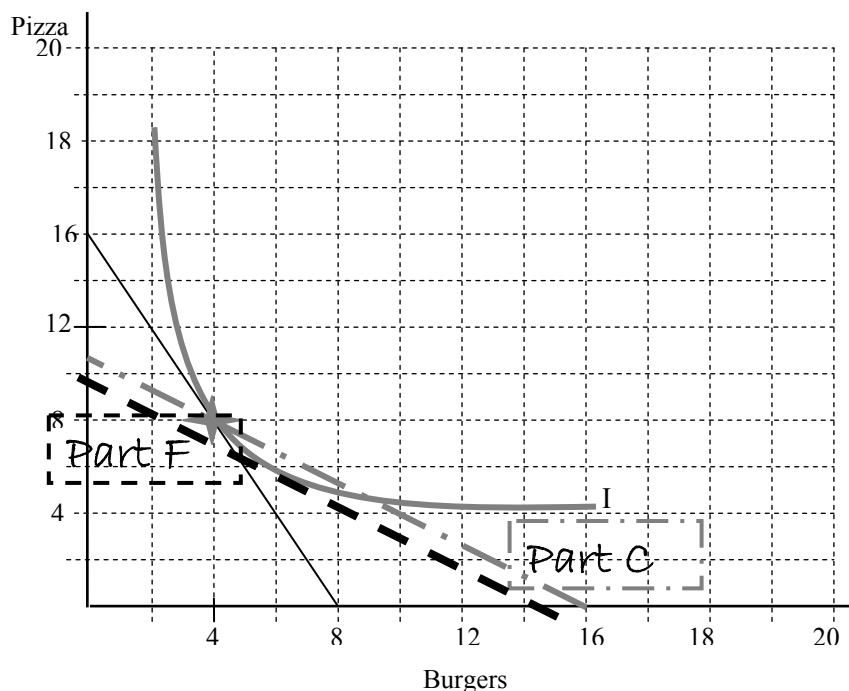
A) $MRS_{BP} = (p_B/p_P) = (4/2) = 2$ The value of another burger in terms of pizza must equal the cost of another burger in terms of pizza, which is 2. OR:
$MU_B/p_B = MU_P/p_P$, $MU_B/4 = MU_P/2$ The marginal utility per dollar, or "bang per buck", is equal for both goods.

B) Yes: $3 \cdot 8 + 2 \cdot 4 = 32$

D) Originally, $MRS_{BP} = 2$. Now, $(p_B/p_P) = (2/3)$. Since $2 > 2/3$, the relative value of a burger now exceeds its relative cost. Andrew will buy more burgers. OR:
Since originally, $MU_B/4 = MU_P/2$, $MU_B/2 > MU_P/3$, MU/p is now higher for burgers, so, Andrew will buy more of them.

E) Higher. The new budget line crosses above the old indifference curve, meaning a higher curve is attainable.

Write your UFID above. Don't write your name. Answer **ONLY** in the space provided below.
Parts of answers shown elsewhere will not be graded. Show your work! It is a good idea to first
organize your answer on the back of another exam page before writing on this sheet!

Fall 2009 Exam 1 Short Answer 1

A) A dollar increase in price reduces purchases per capita by 0.02 units.

B) The numerator is the (squared) variation in the dependent variable accounted for by the model per explanatory variable. The denominator is unexplained (squared) variation, per (independent) observation. A small p-value indicates it is unlikely that this much variation could have been accounted for by K randomly chosen variables.

C) Relationships that hold for observations like those in the data may not hold for observations unlike those in the data. There must be similar observations to the one being predicted for all variables taken together, not just one at a time.

D) $\hat{q} = -6.07 - 2.13 \cdot 5 + 0.39 \cdot 40 + 0.09 \cdot 20 + 0.27 \cdot 100 = 27.68$
$CI = \hat{q} \pm 2\hat{\sigma} = 27.68 \pm 8.4$
$CI = [19.28, 36.08]$

E) $\widehat{q/N} = 0.23 - 0.02 \cdot 5 + 0.004 \cdot 40 + 0.0002 \cdot 20 = 0.294$
$CI = \widehat{q/N} \pm 2\hat{\sigma} = 0.294 \pm 0.06$
$CI = [0.234, 0.354]$

F) $\hat{q} = 100\left(\widehat{q/N}\right) = 29.4$
$CI = [23.4, 35.4]$

G) The signs of all coefficients are reasonable for both models, though advertising is not statistically significant in either model. Overall, both models are statistically significant. Model 2 seems better because: 1) usually, it is more reasonable to expect sales to be proportional to population, 2) the

Write your UFID above. Don't write your name. Answer ***ONLY*** in the space provided below. Parts of answers shown elsewhere will not be graded. Show your work! It is a good idea to first organize your answer on the back of another exam page before writing on this sheet!

confidence interval is narrower, and 3) the RMSE is smaller relative to the predicted value.

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Fall 2009 Exam 2 Short Answer 1

A)

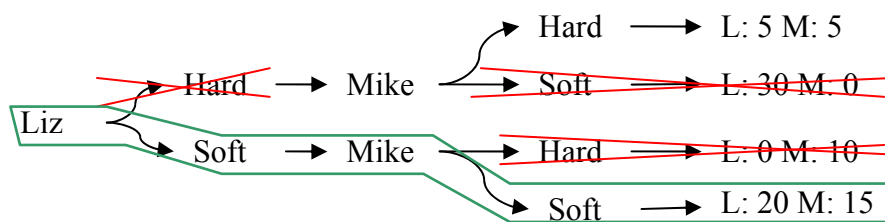|		Mike	
		Soft	Hard
Liz	Soft	L: 20 M: 15	L: 0 M: 10
	Hard	L: 30 M: 0	L: 5 M: 5

2 points total
1 – found the NE for their best responses
1 – marked or described in writing the correct best responses and NE

In the only NE, both play Hard.

B)

In the SPNE, Liz plays Soft and Mike follows with soft.

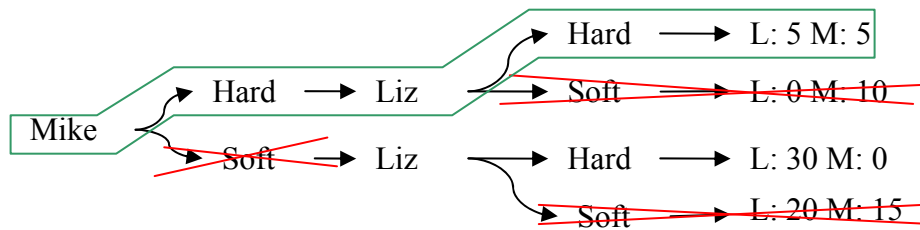4 points total
1 - tree has right structure
1 – payoffs right
1 – tried to identify best responses
1 – right NE for their tree and payoffs

C)

In the SPNE (only NE) Mike plays hard, Liz follows with hard.

4 points total
1 - tree has right structure
1 – payoffs right
1 – tried to identify best responses
1 – right NE for their tree and payoffs

D) Draw the game below. Explain to the right.

		Mike	
		1st	2nd
Liz	1st	L: 5 M: 5	L: 20 M: 15
	2nd	L: 5 M: 5	L: 5 M: 5

There are 2 NE. But, the one where Mike moves first involves BOTH players playing weakly dominated strategies, so, it does not make any sense at all. The sensible equilibrium is for Liz to move first and Mike to follow. Those are weakly dominant strategies for both players.

5 pts total: 1 –table
2 – the NE (one pt each) 2 – explanation

OVERALL
1 pt – UFID   1 pt - No Name   1 pt – neat, organized
1 pt – OK overall quality   1 pt – Very good overall quality

Exam 2 () SA 2 Answer Sheet UFID: KEY

Write your UFID above. Don't write your name. Answer *ONLY* in the space provided below. Parts of answers shown elsewhere will not be graded. Show your work! It is a good idea to first organize your answer on the back of another exam page before writing on this sheet!

Fall 2009 Exam 1 Short Answer 2

A)
$$\pi_E = \left(18 - 0.5q_E - 0.4q_K\right)q_E - 4q_E$$

$$\frac{d\pi_E}{dq_E} = 14 - 0.4q_K - q_E = 0$$

$$q_E^R(q_K) = 14 - 0.4q_K$$

4 points total
1 – any semi reasonable profit function
1 – right profit function
1 – MR=MC for their profit function
1 – right for their profit function

B)
$$\pi_K = \left(18 - 0.5q_K - 0.4(7.78)\right)q_K - 4q_K$$

$$\pi_K = \left(14.89 - 0.5q_K\right)q_K - 4q_K$$

$$\frac{d\pi_E}{dq_E} = 10.89 - q_K = 0$$

$$q_K = 10.89$$

$$p_K = 18 - 0.5(10.89) - 0.4(7.78) = 9.44$$

$$\pi_K = (9.44 - 4)10.89 = 59.27$$

4 points total
1 – any sreasonable profit function using 7.78 for q_E
1 – right profit function
1 – MR=MC for their profit function
1 – right profit for their profit function

C)
$$\left(\frac{1 - 0.05}{0.05 + 0.05}\right)(54.44 - 50) > (59.27 - 54.44)$$

$$(9.5)(4.44) > (4.83)$$

OR

$$\left(\frac{1 + 0.05}{0.05 + 0.05}\right)(54.44 - 50) > (59.27 - 50)$$

$$(10.5)(4.44) > (9.27)$$

3 points
Either way is OK
1 – knew the formula to use
1 – knew how to use r and f
1 – knew how to use the payoffs

D) Noise means punishment will be triggered even when no one cheats. Everyone must believe the punishment will be delivered anyway or everyone would cheat. Without forgiveness, the players would be locked in perpetual non cooperation once the trigger was tripped.

4 points total
1 – Noise means punishment can be triggered without cheating
1 – Everyone must believe punishment will occur, or else they would cheat
1 – Once the trigger is tripped, forgiveness is the only way back to cooperation
1 – puts it all together well

OVERALL
1 pt – UFID   1 pt - No Name   1 pt – neat, organized
1 pt – OK overall quality (most)   1 pt – Very good overall quality (A/B level)

Exam 1 () SA 3 Answer Sheet   **UFID:**   KEY

Write your UFID above. Don't write your name. Answer ***ONLY*** in the space provided below.
Parts of answers shown elsewhere will not be graded. Show your work! It is a good idea to first
organize your answer on the back of another exam page before writing on this sheet!

Fall 2009 Exam 2 Short Answer 3

A) The usual outcome is $A \succ B$ and $C \succ D$. In the model,
$A \succ B$ would mean $Pr(W) > Pr(O)$. But, $C \succ D$ means
$Pr(O) + Pr(B) > Pr(W) + Pr(B)$, or, $Pr(W) < Pr(O)$, which is
contradictory. So, either subjects make inconsistent
subjective probability assessments, or else they exhibit
ambiguity aversion.

5 points total
2 - usual outcomes
2 – describes contradiction
1 – ambiguity aversion

B) In the US $MRTS_{HM} = 120/40 = 3$ to minimize cost. In
developing nations, $MRTS_{HM} = 160/10 = 16$ to minimize
cost. So, input use in the developing nations occurs where
the marginal productivity of high skilled workers is higher
relative to moderate skill workers. That means fewer high
skilled and more moderately skilled workers.
[Could use equal p/MP or equal MP/p instead of
MRTS=pH/pM. There are several other ways to structure this
reasoning that are correct. Grade carefully!]

5 points total
1 – Use a version of the
optimization condition
2 – Used it correctly
2 – Realize it implies relative
productivity of H must be
higher in developing nations,
and that implies lower H/M.

C) Answer parts i-ii in the figure to the right and
part iii on the lines below.

Profit would increase less than it would for a
monopolist. That is because the decrease in B's
price in response to A's price cut reduces A's
demand.
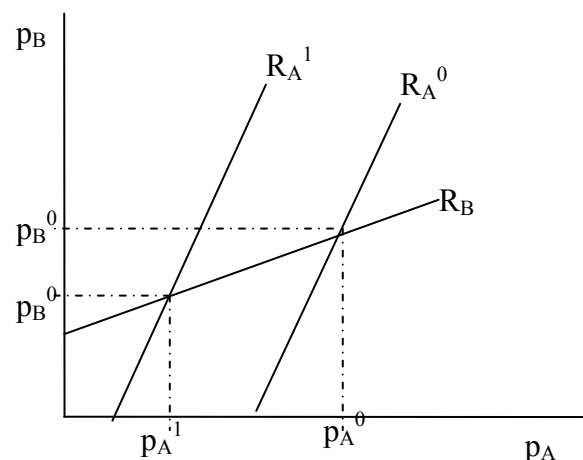
5 points total
1 – reaction functions slope up
1 – reaction functions labeled right
1 - eq prices where they cross
1 – shift correct
1 – explanation

OVERALL
1 pt – UFID   1 pt - No Name   1 pt – neat, organized
1 pt – OK overall quality (most)   1 pt – Very good overall quality (A/B level)

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