Name: _____ KEY _____

100 points total. Point values for each question are as indicated. Answer each question in the space provided. General advice: show your work, including any formulas or diagrams that you use in reasoning through your answers.

1. (10 pts.) Tom worked for many years as manager of a Cracker Barrel Restaurant, earning an annual salary of $100,000. Finally growing tired of working for other people, he decides to open his own restaurant on High Street in Lexington, specializing in southern comfort food and drink. He borrows $500,000 to buy and equip a building for his restaurant, $300,000 of it coming from his retirement savings (where it had averaged 5% per year in growth) and $200,000 of it coming from a bank loan (borrowed at an annual rate of 7%). The restaurant grosses $850,000 in sales each year. Tom incurs wage and salary expenses for his employees of $250,000, wholesale costs of food items of $350,000, and utilities, taxes, insurance, and other assorted expenses of $130,000. Tom doesn't pay himself a salary, but collects the profits from the business since he is the sole owner. After he has owned and operated this business for several years, you ask him if he is happy with his decision. He says that he has no regrets at all, preferring this to his next best alternative. How much does Tom value being his own boss? Hint: calculate Tom's economic profits.

Revenues: $ 850,000

Explicit Costs:

    bank loan interest - 7% * $200k = $14,000

    wages and salaries   250,000

    wholesale cost of food   350,000

    taxes, utilities, etc.   130,000

Implicit Costs:

    loan to self 5% * $300k =   15,000

    opportunity cost of his time   100,000

                                     $ 859,000

Economic profit = $850,000 - $859,000 = -$9,000

If Tom is doing $9,000 worse each year than his next best alternative, then he must place at least a $9000 value on being his own boss.

2. (5 pts.) Refining capacity (in 1,000 barrels per day) of the major petroleum refiners in the U.S. are given below:

   a. Valero — 1,904
   b. Exxon Mobil — 1,856
   c. Marathon — 1,714
   d. Phillips 66 — 1,591
   e. Motiva — 1,073
   f. Chevron — 943
   g. Tesoro — 834
   h. Citgo — 763
   i. Koch Industries — 690
   j. BP — 649

   12,017 barrels of refining capacity in the industry

There are many smaller refineries in addition to these, but for purposes of answering this question you can ignore them. Compute the HHI for the petroleum refining industry.

$$HHI = \sum_{i=1}^{n} s_i^2$$

$$= \left[\left(\frac{1904}{12017} \right)^2 + \left(\frac{1856}{12017} \right)^2 + \ldots + \left(\frac{649}{12017} \right)^2 \right] \times 10,000$$

$$HHI \approx 1153$$

3. (6 pts.) TWC, the local cable TV monopolist, charges $15 per month for their HBO premium movie package of channels. HBO charges TWC $5 for each subscriber. TWC has done its homework, and is confident that it is charging the profit-maximizing price. If they are correct, calculate own price elasticity of demand for the HBO channels.

$$\pi_{MAX} \Rightarrow \frac{P - mc}{P} = \frac{1}{\mathcal{E}_{x, P_x}}$$

$$P = 15, \quad mc = 5$$

$$\frac{P - mc}{P} = \frac{15 - 5}{15} = \frac{2}{3} = \frac{1}{\mathcal{E}_{x, P_x}}$$

$$\mathcal{E}_{x, P_x} = 1.5$$

4. (9 pts.) Shown below are the AVC, ATC, and MC curves for one of several miniature golf courses in a large beach resort. Illustrate and label demand curves consistent with each of the following situations. Briefly explain your answers:

(3 pts) a) D_1: It is wintertime and when we drive by the golf course, a sign says "closed for the season."

(3 pts) b) D_2: It is springtime and the golf course is open. The owner tells us that she couldn't survive if business were like this all year round.

(3 pts) c) D_3: It is the peak of the season, the parking lot is full, and the owner has a smile on her face.
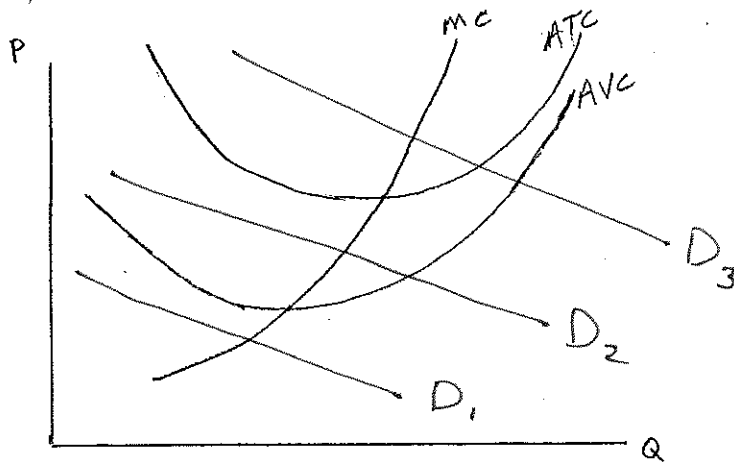
$D_1 \Rightarrow P < AVC$, so shut down

$D_2 \Rightarrow P > AVC$ but $P < ATC$, operate at a loss

$D_3 \Rightarrow P > ATC$, so you are making positive economic profit

Note: demand curves are downward sloping because the product is differentiated.

5. (8 pts.) RE *WSJ* 2003, "Cruise Lines . . . as War Fears Rattle Travelers." Using Porter's five forces model, discuss the nature of the economic rivalry among cruise ship firms operating in the European/Mediterranean market in the early 2000's.
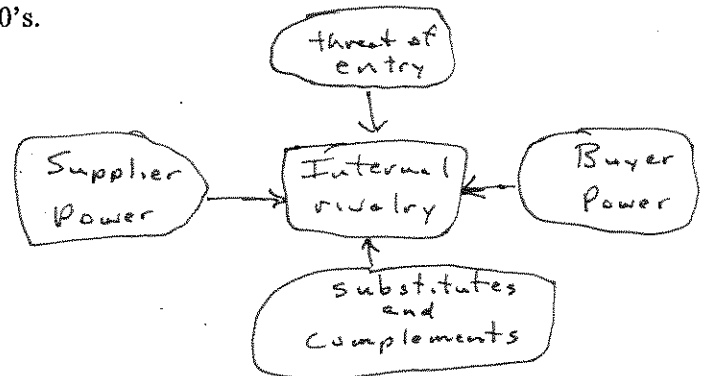
Threat of entry is fairly low. Supplier Power and Buyer Power are not really issues in this market. Consumers have many good substitutes for a Mediterranean cruise. The big issue is that cruise lines have to commit capacity far in advance of sailing, so if demand drops off due to fear of war, then fierce price competition breaks out.

6. (13 pts.) The inflation-adjusted price of corn was steady at $4 per bushel through the early 2000's. Then in 2005 Congress passed a law that provided significant subsidies for the production of ethanol, produced using corn. Demand for corn increased dramatically, and the price of corn rose to over $7 per bushel by 2007. It stayed there for a couple of years, and then started to fall. By 2010 the price per bushel was back to $6, and more recently (2014) the price has returned to the $4 per bushel range. While the output of individual corn farmers has risen and fallen over that period and the number of corn farmers has changed, the average farm size (in terms of number of acres) has not changed. In the diagram below on the left, draw the market demand and supply curves for 2005, 2007, 2010, and 2014. Be sure to label them. In the diagram on the right, draw the ATC and MC curves for a typical corn farmer, and illustrate their profit position in 2007. Factoid: the average size = 600 acres, and average output per acre = 150 bushels of corn. [600 acres * 150 bu/acre = 90,000 bu]

Corn Market (billions of bushels)

Typical Corn Farmer (thousands of bushels)

(5 pts.)

q^*_{2007}
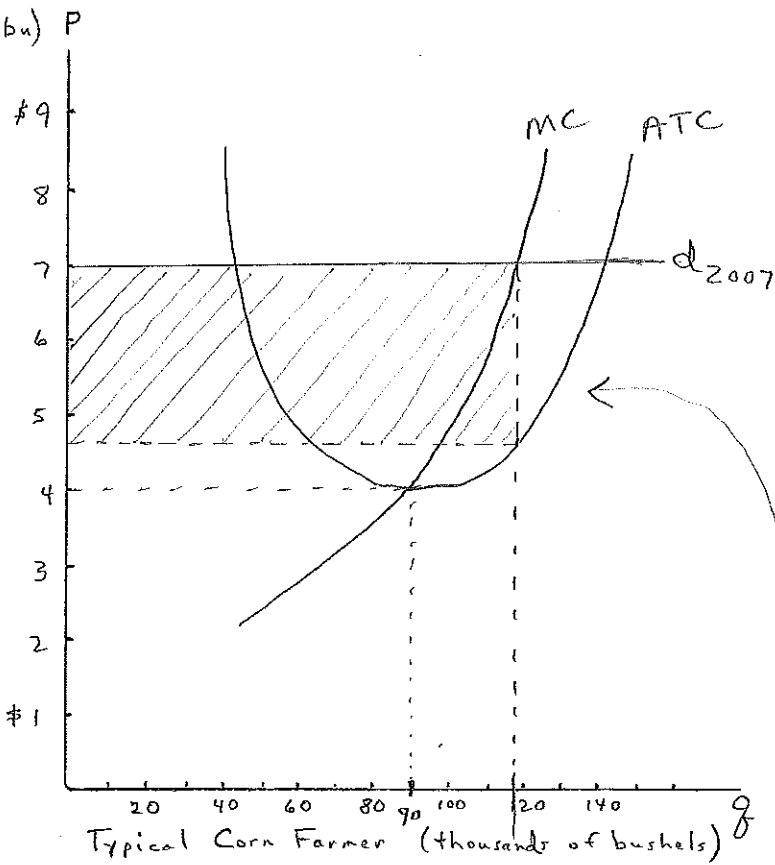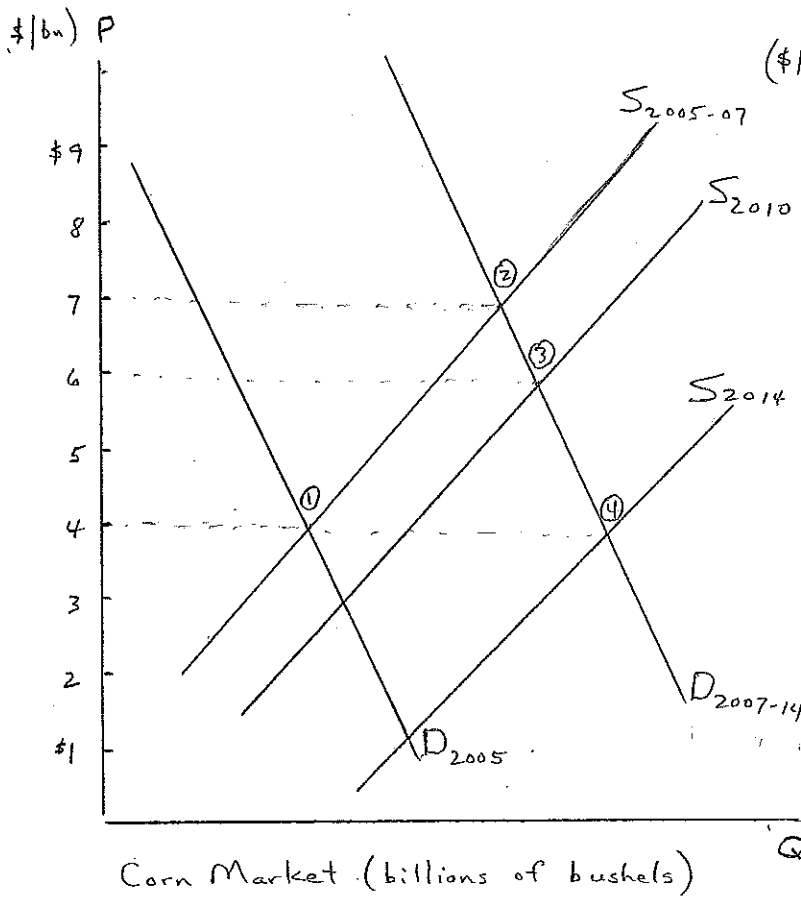
(2pts) ① Market equilibrium in 2005

(2pts) ② " " " 2007

(2pts) ③ " " " 2010

(2pts) ④ " " " 2014

farmer's economic profit in 2007 when $P_{mkr} = 7

7. (24 pts.) You own and operate a bar close to the UK campus. After some experimentation, you determine that the typical male patron has the following demand for beer: $q = 5 - P_B$. P_B is the price per beer and q is number of beers each male patron chooses to consume on any given visit to your bar. Your costs for beer are $MC = AC = \$1$.

a) What price per beer will maximize profit, how many beers will each patron consume, and what will you earn on each customer? Illustrate in the diagram below.

b) Now, suppose you can charge an entry fee or cover charge to get in the bar. Would you set P_B differently? What cover charge would you set? What profits will you earn on each customer? Illustrate in the diagram.
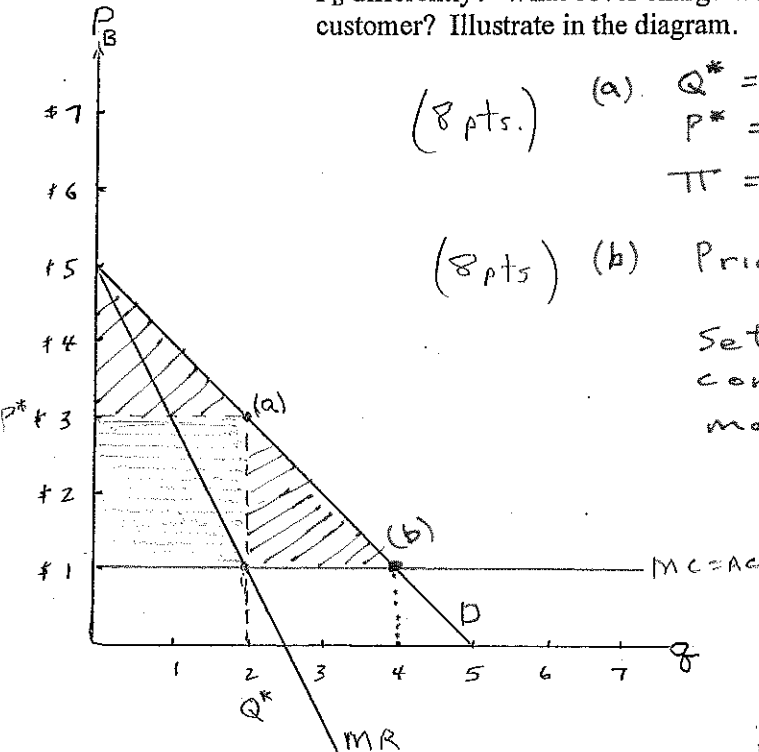
(8 pts.) (a) $Q^* = 2$ where $MR = MC$
$P^* = 3$ " " "
$\pi = (P^*-AC)Q^* = (3-1)2 = \$4 \Rightarrow$ ▨

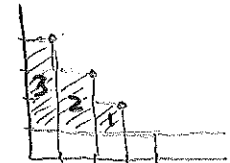(8 pts) (b) Price per beer: P_B – set $P_B = MC = \$1$
Set cover charge equal to consumer's surplus when typical male patron consumes 4 beers @ $1 each

$CV_M \Rightarrow$ $= \frac{1}{2}(4)(4)$
                    $= \$8$

Alternatively:
$CV_M = 3 + 2 + 1 = \$6$

(8 pts.) c) Finally, let's consider how your overall pricing strategy affects the number of customers who come to your bar. Suppose $F = 50 - 10CV_F$ and $M = 35 + F - 5P_B - 2CV_M$, where F is the number of female customers, M is the number of male customers, CV_F is the cover charge for female patrons, and CV_M is the cover charge for male patrons. Discuss conceptually (don't calculate) how you might take these interactions into account in setting the price for beer and the cover charges for males and for females. Why might setting different beer prices for males and for females be problematical?

If the MBA consulting team you hired to conduct this demand study has given you accurate information, then you know the following. Female demand depends on the cover charge alone. Women are not sensitive to the price you charge for beer. If you do not charge them an entry fee, then 50 women will show up at your bar.

Male demand depends of the number of women in your bar, the price of beer, and the entry fee that you charge for men. If you let women in for free, set the price of beer at $1, and charge $6 entry fee for men, then (35+50-5-12=68) men will show up in your bar.

Since the number of female patrons is relatively sensitive to the female cover charge, and the number of male patrons is relatively sensitive to the number of female patrons and the price of beer, then it would seem to make sense to declare "lady's night—no cover charge for women", set the price of beer at marginal cost, and make your profits by gouging males with a stiff cover charge.

Since it is impractical to monitor and control "resale" of beer inside your bar, if you charge a higher price to females for beer than you charge males, then you probably won't sell very many female beers. This might not be a bad marketing idea, however, if it promotes more social interaction inside your bar as males offer to buy drinks for females.

8. (25 pts.) You live on a small island in the Aegean Sea. The island has considerable tourist potential, except that it only gets ferry service once a week. You have done research on tourism for similar Greek islands, and you have estimated that demand for hotel rooms on this island would be Q = 10 − P, if only the ferry came every day instead of once per week. Q is the number of hotel rooms demanded by tourists each night, and P is the price per room. Assume that marginal costs are constant at 2 per room per night (MC=AC=2).

a) Suppose that the Blue Star Ferry Line announces that it will begin providing daily service to your island. If you could be guaranteed a monopoly position in this market (not outside the realm of possibility since the island governing council is dominated by your close relatives), how big of a hotel would you build, i.e. how many rooms? Hint: calculate the profit maximizing price and quantity. What would your profits be?

(4 pts.)
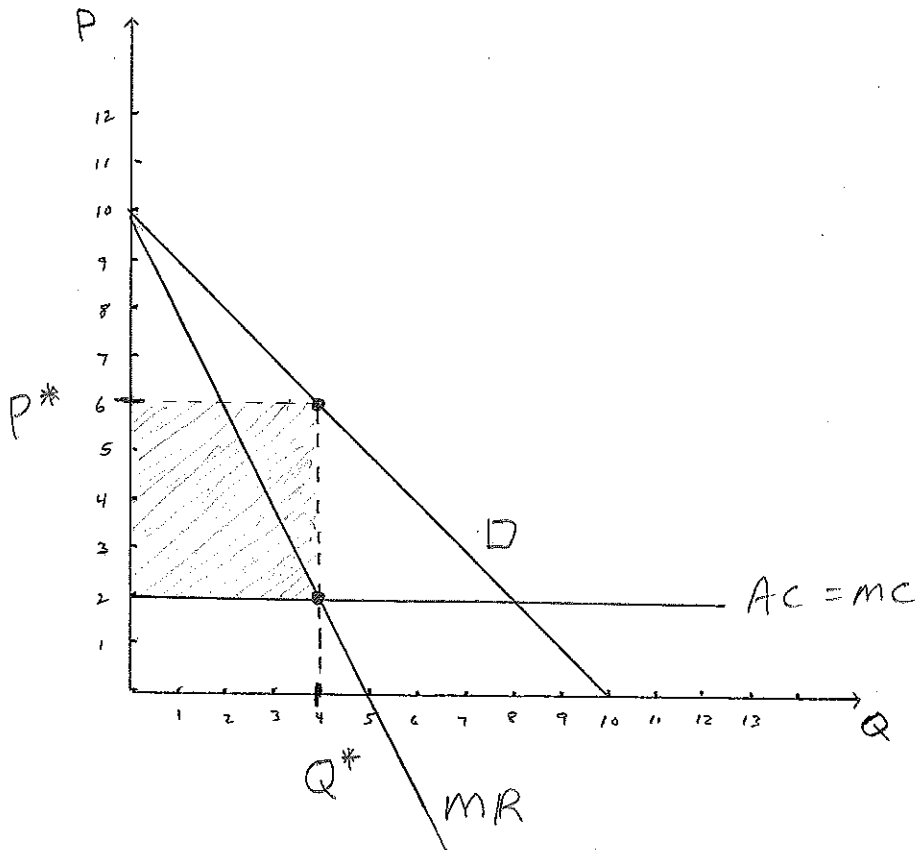
$Q^* = 4$ rooms

$P^* = 6$ bitcoin per night

$\pi = (P - AC)Q = (6-2)4 = 16$ bitcoin per night

b) Now suppose that the island governing council decides to grant operating licenses to two hotels, yours and one proposed by your cousin. You have never been able to fully trust your cousin, and now you are aligned against him in a simultaneous-move game—you both have to decide how much capacity (how many rooms) to build into your hotels. You have narrowed your viable choices to 2, 3, or 4 rooms. Your cousin has the same options in building his hotel. The following payoff matrix lays out the possible strategies and payoffs:

(8 pts.)

		You		
		Q = 2	Q = 3	Q = 4
Your cousin	Q = 2	8, 8	5, 9	4, 8
	Q = 3	9, 5	6, 6	3, 4
	Q = 4	8, 4	4, 3	0, 0

If you and your cousin each have to make your capacity choice simultaneously, what will be the likely outcome of this game? Explain your reasoning.

For row player, [Q=4] strategy is dominated by [Q=3] strategy, so [Q=4] row can be eliminated from consideration.

For column player, [Q=4] strategy is dominated by [Q=3] strategy, so [Q=4] column can be eliminated from consideration.

In the remaining 2×2 payoff matrix, both players have a dominant strategy of choosing [Q=3]. So [Q=3] for the row player and [Q=3] for the column player is the expected outcome of the game.

∴ you and your cousin build 3-room hotels and earn profits of 6 bitcoin per night.

c) Instead of you and your rival moving simultaneously, suppose instead that your cousin is getting his MBA in the U.S.A. and won't be home to start his hotel for another year. So you have the opportunity to make your capacity choice and build your hotel before he gets back, and then he will make his capacity decision second after you have made the first move. Based on the information in the above payoff matrix, write out the game tree for this sequential-move game. What will be the outcome of the game? Briefly explain.

(8 pts.)
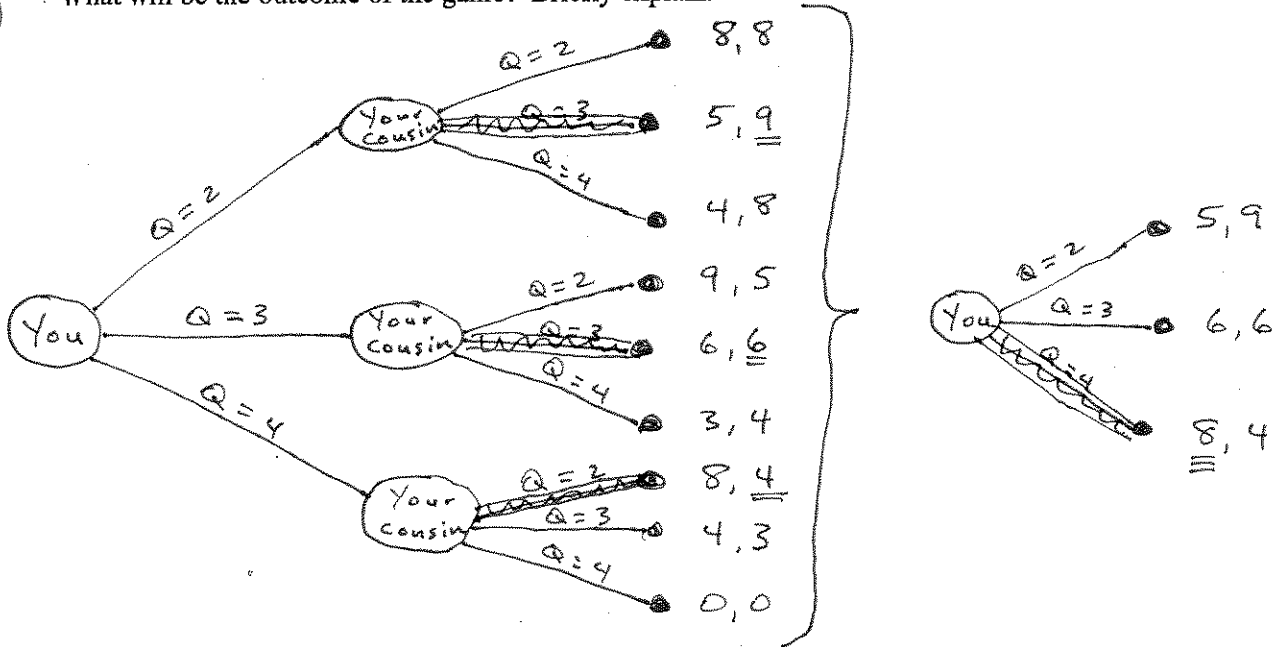
You have what is known as a first-mover advantage in this game. By building a hotel with 4 rooms, you can put your cousin in a position where his best strategy is to build a smaller hotel with only 2 rooms. Your profits increase from 6 to 8 when you move first.

d) Draw the profit possibilities frontier for this market in the diagram below, where your cousin's profits are measured on the vertical axis and your profits are measured on the horizontal axis. Illustrate the three possible outcomes you have just analyzed in your diagram.

(5 pts.)
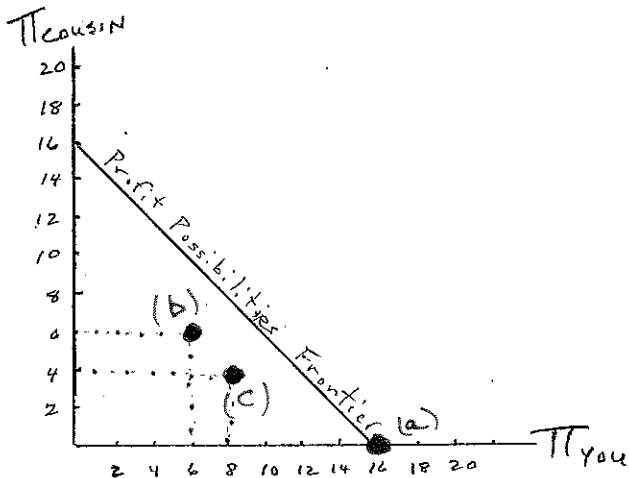
(a) You are a monopoly, maximum profit (=16) is earned.

(b) imperfect collusion, simultaneous-move duopoly results in sharing equally profits (=12)

(c) imperfect collusion, as first mover you attain $\pi = 8$ and cousin gets $\pi = 4$