

100 points total. 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. (5 pts.) Knowing what you do about the market for pizzas in West Liberty, KY, would you expect producers to be able to earn persistent (long-run) above-normal returns? Briefly explain why or why not.

The threat of entry, in particular hit-and-run entry by Papa John's Pizza in Morehead, KY, keeps the two pizza restaurants in West Liberty from being able to make persistent economic profits.

2. (25 pts.) Ralph and Colleen play a game. Sometimes they both select their strategy at the same time, sometimes Ralph chooses his strategy first and Colleen chooses her strategy after she sees what Ralph has decided, and sometimes Colleen goes first and Ralph chooses second. The payoff matrix for this game is as follows, where Ralph's payoff is listed first and Colleen's payoff is listed second:

		Colleen		
		Left	Middle	Right
Ralph	Top	3, 1	2, 3	10, 2
	High	4, 5	3, 0	6, 4
	Low	2, 2	5, 4	12, 3
	Bottom	5, 6	4, 5	9, 7

- a. Suppose Ralph and Colleen choose their strategies simultaneously. How do you think the game will turn out? Use the solution concepts we developed in class and explain your answer in a step by step fashion.

Neither Top nor High are rationalizable strategies, because neither is a best response for Ralph. If they are eliminated, then Left is not rationalizable for Colleen, because it is not a best response. In the remaining  $2 \times 2$  payoff matrix, Ralph has a dominant strategy of Low. Knowing this, Colleen will play Middle. The strategy pair Low, Middle is a Nash equilibrium, because each player has chosen their best strategy given the strategy of the other.

100 points total. 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.

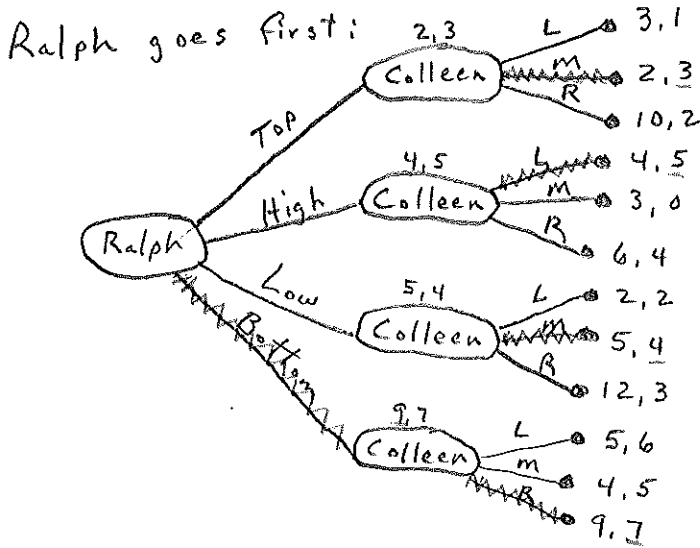
1. (5 pts.) Knowing what you do about the market for pizzas in West Liberty, KY, would you expect producers to be able to earn persistent (long-run) above-normal returns? Briefly explain why or why not.
  
2. (25 pts.) Ralph and Colleen play a game. Sometimes they both select their strategy at the same time, sometimes Ralph chooses his strategy first and Colleen chooses her strategy after she sees what Ralph has decided, and sometimes Colleen goes first and Ralph chooses second. The payoff matrix for this game is as follows, where Ralph's payoff is listed first and Colleen's payoff is listed second:

		Colleen		
		Left	Middle	Right
Ralph	Top	10, 2	3, 1	2, 3
	High	9, 7	5, 6	4, 5
	Low	12, 3	2, 2	5, 4
	Bottom	6, 4	4, 5	3, 0

- a. Suppose Ralph and Colleen choose their strategies simultaneously. How do you think the game will turn out? Use the solution concepts we developed in class and explain your answer in a step by step fashion.

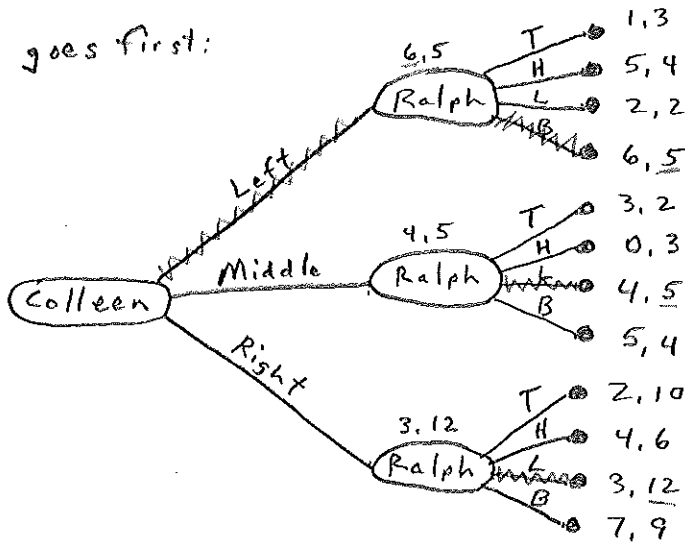
Neither Top nor Bottom is a rationalizable strategy for Ralph, since neither is a best response. If they are eliminated, then Middle is not rationalizable for Colleen, because it is not a best response. In the remaining 2x2 payoff matrix, Ralph has a dominant strategy of Low, knowing this, Colleen will play Right. This strategy pair, Low, Right, is a Nash equilibrium, because each player has chosen their best strategy given the strategy chosen by the other one.

- b. Now suppose that Ralph and Colleen decide to play the game sequentially, with one of them going first and the other one choosing their strategy after seeing the strategy choice of the one who went first. Feeling chivalrous, Ralph lets Colleen choose whether she wants to go first or second. Colleen turns to you for advice. Draw two game trees and explain whether Colleen should choose to go first or second.



SPNE is Ralph plays Bottom and Colleen plays Right. Ralph receives payoff of 9 and Colleen receives 7.

Colleen goes first:



SPNE is Colleen plays Left and Ralph plays Bottom. Colleen receives a payoff of 6 and Ralph receives 5.

Both Ralph and Colleen are better off if she goes second.

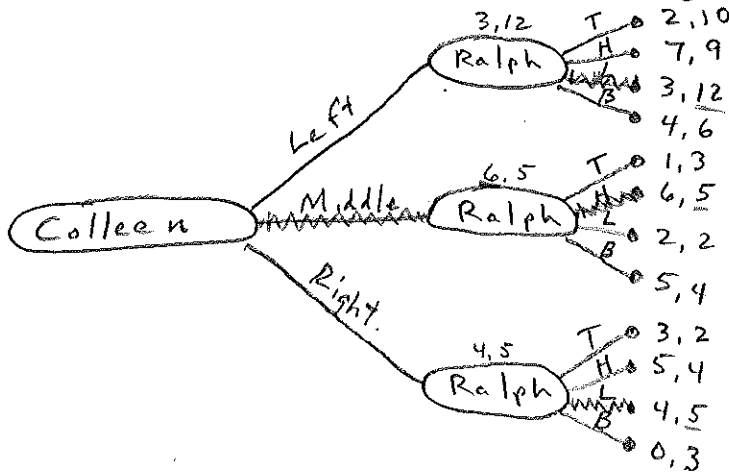
3. (5 pts.) In 2009 the market shares of different television set manufacturers were Samsung - 17.2%, LG - 14.8%, Panasonic - 6.9%, TCL - 6.6%, Sony - 5.9%, and all others 48.6%. Suppose "all others" consisted of nine firms, each having 5% market shares and one firm having 3.6% market share. Compute the HHI.

$$HHI = \sum_{i=1}^n s_i^2 \quad \text{where } s_i = \text{market share of } i\text{th firm.}$$

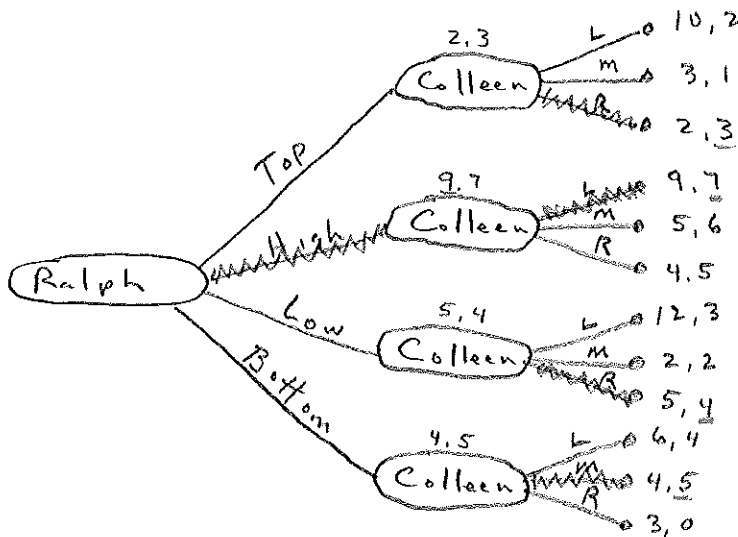
$$HHI = (17.2)^2 + (14.8)^2 + (6.9)^2 + (6.6)^2 + (5.9)^2 + 9 \cdot (5)^2 + (3.6)^2$$

$$HHI = 878.8$$

- b. Now suppose that Ralph and Colleen decide to play the game sequentially, with one of them going first and the other one choosing their strategy after seeing the strategy choice of the one who went first. Feeling chivalrous, Ralph lets Colleen choose whether she wants to go first or second. Colleen turns to you for advice. Draw two game trees and explain whether Colleen should choose to go first or second.



SPNE is Colleen plays Middle and Ralph plays High. Colleen receives 6 and Ralph receives 5



SPNE is Ralph plays High and Colleen plays Left. Ralph receives 9 and Colleen receives 7.

Both Ralph and Colleen are better off if Ralph goes first.

3. (5 pts.) In 2009 the market shares of different television set manufacturers were Samsung - 17.2%, LG - 14.8%, Panasonic - 6.9%, TCL - 6.6%, Sony - 5.9%, and all others 48.6%. Suppose "all others" consisted of twelve firms, each having 4% market shares and one firm having 0.6% market share. Compute the HHI.

$$HHI = \sum_{i=1}^n s_i^2 \text{ where } s_i^2 = \text{market share of } i\text{th firm.}$$

$$HHI = (17.2)^2 + (14.8)^2 + (6.9)^2 + (6.6)^2 + (5.9)^2 + 12(4)^2 + (.6)^2$$

$$HHI = 833.2$$

4. (10 pts.) Your professor's brother-in-law Bubba owns a restaurant/bar in Fort Walton Beach, Florida. On a recent visit Bubba shared the following information:

<u>Income Statement for Bubba's Bar</u>	
<u>Costs</u>	<u>Revenues</u>
Wholesale cost of food and beer	\$40,000
Wages and salaries (including \$20,000) for himself	\$50,000
taxes and insurance	\$12,000
interest paid on bank loans \$100,000 @ 10%	\$10,000
	\$112,000

Bubba has \$50,000 of his own money invested in the bar. He anticipates that business will continue like this for the foreseeable future. Bubba also has a standing offer of \$30,000 to manage another bar in Fort Walton Beach. Suppose a national restaurant/bar chain offers Bubba \$150,000 to sell his bar, which would enable him to pay back the \$100,000 bank loan and recoup his own \$50,000. Should he take the offer? (Hint: what are Bubba's economic profits?)

Bubba's accounting profit =  $\$130,000 - \$112,000 = \$18,000$

Implicit costs not accounted for in the above:

(1) opportunity cost of his time = \$10,000  
( $\$30,000 - \$20,000$  he pays himself)

(2) interest earnings forgone on his investment ( $\$50,000 @ 10\%$ ) = \$5,000

So his economic profits are  $\$130K - 112K - 10K - 5K = \underline{\$3000}$

If Bubba were to sell the bar and work for someone else, he would bring home \$35,000 per year (\$30,000 salary plus \$5,000 interest earnings). That is \$3000 less than he is currently making (\$20,000 salary + \$18,000 profit).

5. (5 pts.) In the Trojan War, the Greeks landed on the shore of Troy and then marched overland to the walled city of Troy. After a long and bloody battle, the Greeks were exhausted. While the Greek army slept, the Trojan king sent a raiding party behind the Greek lines to burn the Greeks' ships. Knowing what you do about game theory, was this a good or a bad strategic move?

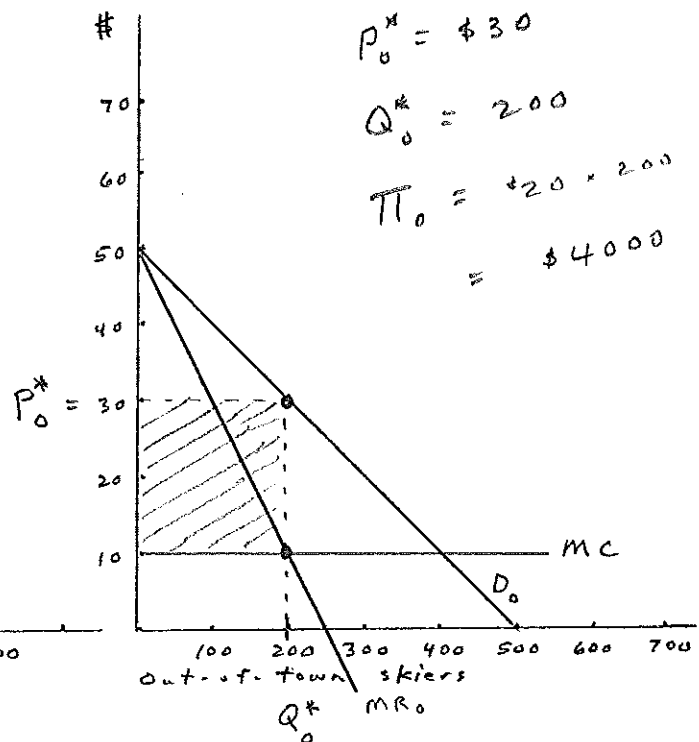
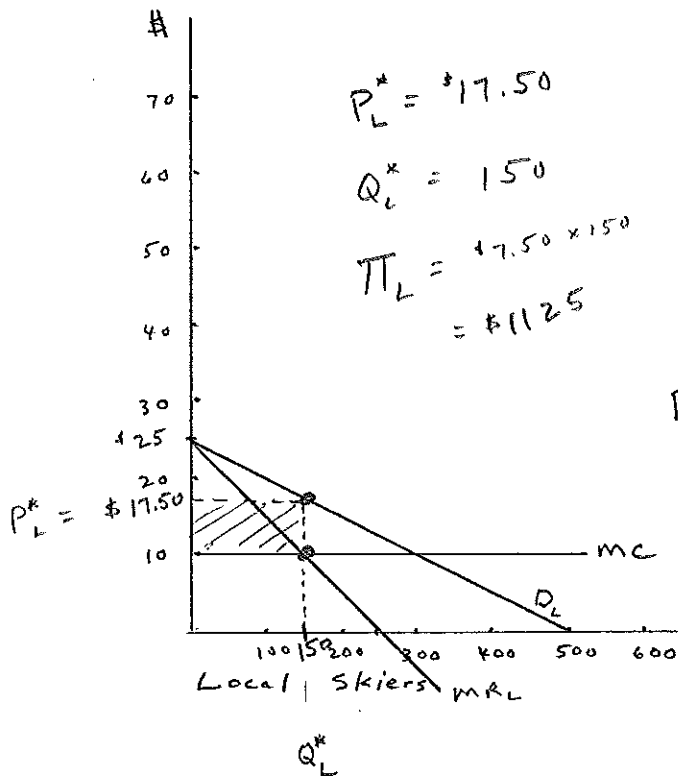
The Trojan king has made a tactical error. He has not left the Greeks an easy exit from the battle. Now the Greeks will be more likely to continue fighting, because there is no longer the option of retreating. Bad strategy by the Trojans.

6. (20 pts.) Snowfish Ski Resort has two different types of customers, local skiers and out-of-town skiers. By asking to see a driver's license, the resort can determine their type and charge each group different prices. Their respective demand curves are given by:

a. Local:  $Q_L = 500 - 20P_L$

b. Out-of-town:  $Q_O = 500 - 10P_O$

The marginal cost of servicing a skier of either type is constant and equal to \$10. Use the diagrams below to determine the profit-maximizing prices and quantities for each category of skier. How much profit does Snowfish make?



$$\pi_{Total} = \$1125 + \$4000 = \$5125$$

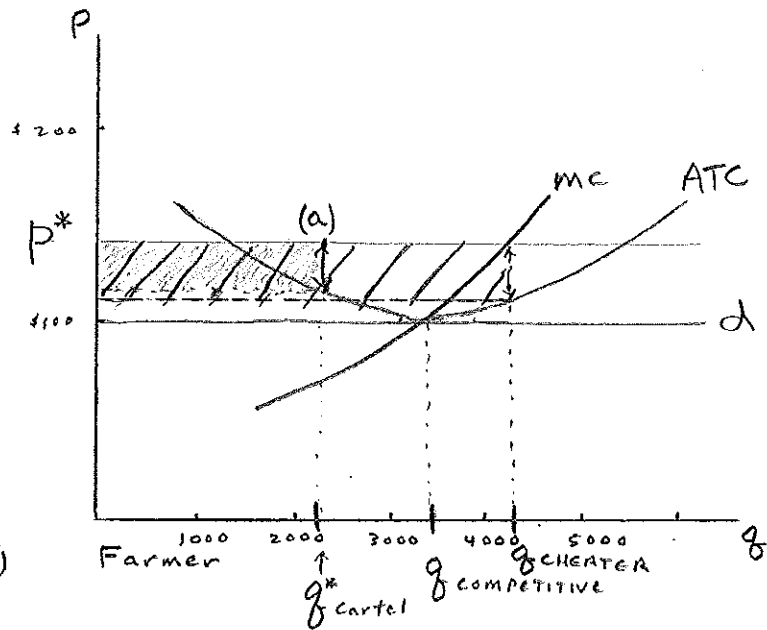
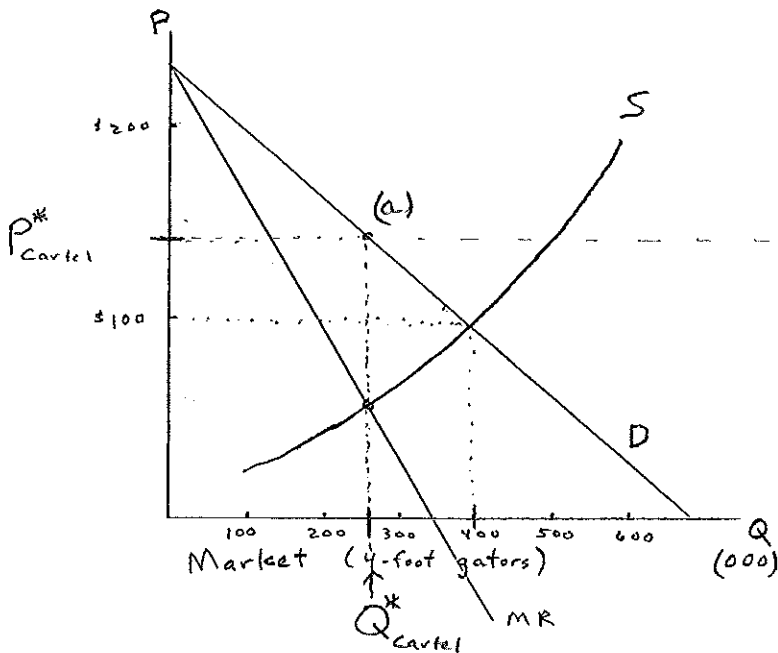
Without using the formula for elasticity of demand and calculating it directly, can you determine what own-price elasticity of demand is at  $P_L, Q_L$ ? at  $P_O, Q_O$ ?

$$\frac{P - MC}{P} = \frac{1}{E_{X, P_X}} \quad \text{at } P^* \text{ and } Q^* \text{ that maximize profit}$$

$$\text{Local: } \frac{17.5 - 10}{17.5} = \frac{1}{E_{X, P_X}} \Rightarrow E_{X, P_X} = 2.33$$

$$\text{Out-of-town: } \frac{30 - 10}{30} = \frac{1}{E_{X, P_X}} \Rightarrow E_{X, P_X} = 1.5$$

7. (20 pts.) The American Alligator Association is a trade group that represents alligator farmers in America. Right now, the industry is in long-run equilibrium. As president of AAA, you see an opportunity for alligator farmers to increase their profits. Next month the association is having its annual convention in Baton Rouge, and every alligator farmer in the country will be present. You would like to make a presentation to the group and explain how they can each make above-normal profits if they will cooperate and act in unison, rather than competing so vigorously with one another.
- a) Using diagrams for the alligator market and for a representative firm, explain how an alligator cartel could accomplish this.



Restrict market output from 400,000 to  $Q^*_{cartel}$  by getting each farmer to cut back from  $q_{comp.}$  to  $q^*_{cartel}$ . Price will rise to  $P^*_{cartel}$  and each farmer will earn profits equal to  $\text{shaded area}$ .

- b) What are the long-run prospects for such a cartel, assuming that it is initially successful? Explain your reasoning using the same diagrams that you introduced in part (a).

If one farmer decides to cheat, he can increase his profits to  $\text{shaded area}$  by increasing his output to  $q_{cheater}$ , where  $P^*_{cartel} = MC$ . Since every farmer has the same incentive to cheat on the cartel agreement, the cartel will tend to be unstable.

8. (5 pts.) Microsoft recently developed a search engine, Bing, that competes with Google's search engine. Google recently announced that it is developing an operating system that will compete with Microsoft's Windows. Each company now must choose whether to compete vigorously in the other company's main product market, or **not** to aggressively try to grab market share with its new product. Draw a 2x2 payoff matrix with imaginary numbers that are consistent with the two companies adopting nonaggressive strategies towards each other.

		Microsoft	
		war	peace
Google	war	60, 60	140, 40
	peace	40, 140	100, 100

If they play the game once, they are likely to both choose war. But if they play

an infinitely repeated game, they are likely to choose to adopt a nonaggressive strategy towards one another.

9. (5 pts.) Give an example of the "mind games" that Frontier Airlines plays with United Airlines.

- fly only twice a day to cities where United flies out of Denver.
- schedule flights that arrive and depart at different times than United's flights.
- wait until United announces its schedule before setting its own schedule.
- keep its own prices close enough to United's prices so as not to provoke an aggressive response.