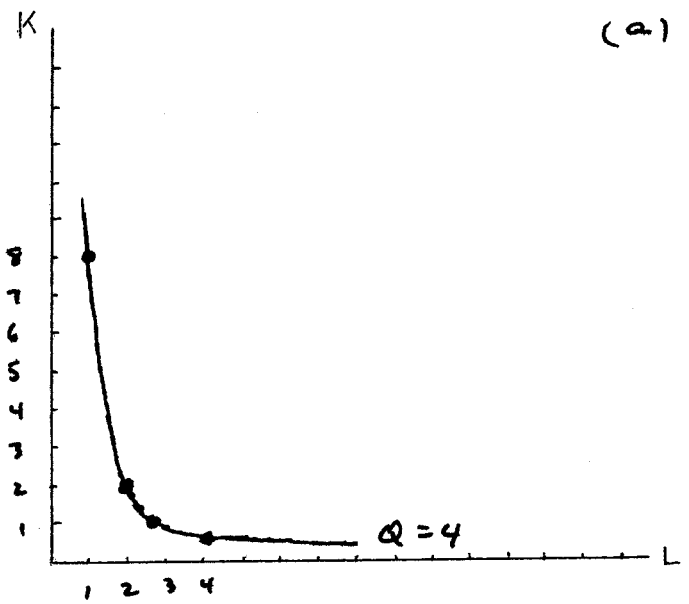
ECO 610-401
Fall 2002
Final Exam

Name: KEY

ID #: _____

100 pt. total. Answer in the space provided.

1. (15 pts.) You own a small woodworking business, and specialize in making high-end furniture. Production of walnut armoires is characterized by the following production function: $Q=2K^{1/3}L^{2/3}$, where Q represents output of armoires and K and L represent units of capital and labor used in the production process.
   a) Draw the isoquant corresponding to Q=4.
   b) If w=8 and v=4, where w and v are the per unit prices of labor and capital, respectively, what combination of L and K should you use to produce 4 armoires?



(a) $Q = 2K^{1/3}L^{2/3}$

if $Q=4$: $4 = 2K^{1/3}L^{2/3}$

$K^{1/3}L^{2/3} = 2$

$KL^2 = 8$

K	L
2	2
1	$\sqrt{8}$
8	1
$\frac{1}{2}$	4

(b) Cost minimization $\Rightarrow \frac{MP_L}{MP_K} = \frac{w}{v}$

$MP_L = \frac{dQ}{dL} = \frac{4}{3}K^{1/3}L^{-1/3}$

$MP_K = \frac{dQ}{dK} = \frac{2}{3}K^{-2/3}L^{2/3}$

$\frac{MP_L}{MP_K} = \frac{4/3\ K^{1/3}L^{-1/3}}{2/3\ K^{-2/3}L^{2/3}} = \frac{2K}{L} \Leftrightarrow \frac{8}{4} = \frac{w}{v}$

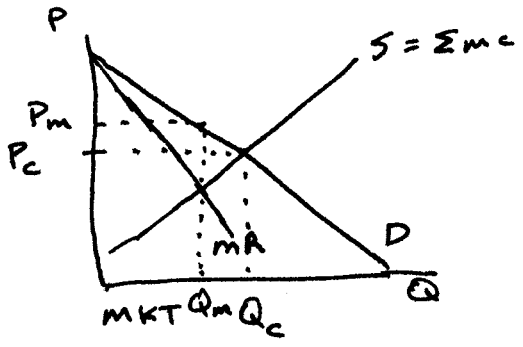
$\frac{2K}{L} = 2$, or $K = L$ for cost minimization

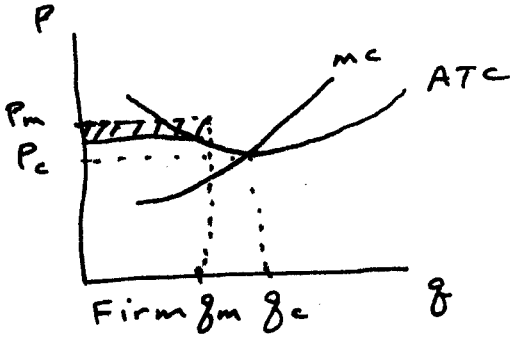
if $Q=4$: $4 = 2K^{1/3}L^{2/3}$, $2 = K^{1/3}K^{2/3} = K$

and $L = 2 = K$

2. (15 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.
   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).

(a)





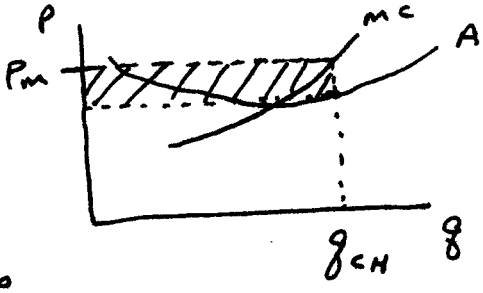
$Q_c = \Sigma q_c$

$Q_m = \Sigma q_m$

$P_c, Q_c \Rightarrow$ competitive outcome

$P_m, Q_m \Rightarrow$ cartel outcome which yields positive economic profit for each farmer ▨

(b) A cheater on the cartel could increase its profits by expanding output to the point where $P_m = mc$:



If each firm has an incentive to cheat, then the cartel will tend to break down as firms expand their individual outputs.

3. (15 pts.) You own and operate a fast-food restaurant near the UK campus. Your cost function is given by $C = 900 + 60Q + 9Q^2$. Demand for meals at your restaurant is given by $P = 660 - 16Q$.
   a) What price and output should you choose in order to maximize profit?
   b) Predict the future in this market given the above information.

(a) $C = 900 + 60Q + 9Q^2$

$MC = \frac{dC}{dQ} = 60 + 18Q$

$P = 660 - 16Q$

$TR = 660Q - 16Q^2$

$MR = \frac{dTR}{dQ} = 660 - 32Q$

$MR = MC \Rightarrow 660 - 32Q = 60 + 18Q$

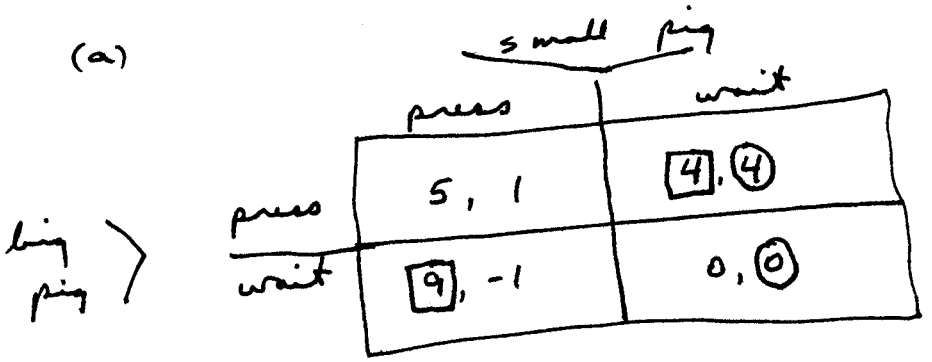
$600 = 50Q$; $Q = 12$, $P = 468$

(b) $\Pi = TR - TC = 5616 - 2916 = 2700$

If other restaurants are earning similar positive economic profits, then we would expect entry into this monopolistically competitive industry. Expected long-run economic profit $\Rightarrow$ zero.

4. (15 pts.) One large pig and one small pig are placed in a box. At one end is a lever which when pressed causes a dispenser at the other end of the box to release ten units of food. The effort expended in pressing the lever costs each pig two units. If the small pig presses the lever, the big pig eats nine units of food and only one unit is left for the small pig, so the small pig receives a payoff of -1 units. If the big pig presses the lever, the small pig can consume four units of food by the time the big pig has crossed the box. If both pigs press the lever, the small pig can get to the food first, but can only consume three units of food by the time the big pig arrives and shoves it aside. If neither pig presses the lever, each gets zero.
   a) Illustrate the payoff matrix for this game.
   b) What do you predict will be the outcome and why?
   c) Is your predicted outcome a Nash equilibrium? Explain why or why not.

(a)



(b) Dominant strategy for small pig is to wait. Realizing that, the big pig will choose to press the lever.

(c) The predicted outcome is a Nash equilibrium. Given that the small pig chooses to wait, the big pig's best strategy is to press. Given that the big pig chooses to press, the small pig's best strategy is to wait.

5. (15 pts.) Consider the following game:

	C1	C2	C3	C4
R1	10,7	8,8	0,6	2,6
R2	6,5	2,3	5,1	7,4
R3	0,4	5,8	3,7	5,10
R4	4,6	9,8	6,9	1,1

Using the iterative elimination of never-best responses, find the set of rationalizable strategies. Find the Nash equilibrium.

Circles represent the column player's best response to a given row strategy. Squares represent the row player's best response to a given column strategy.

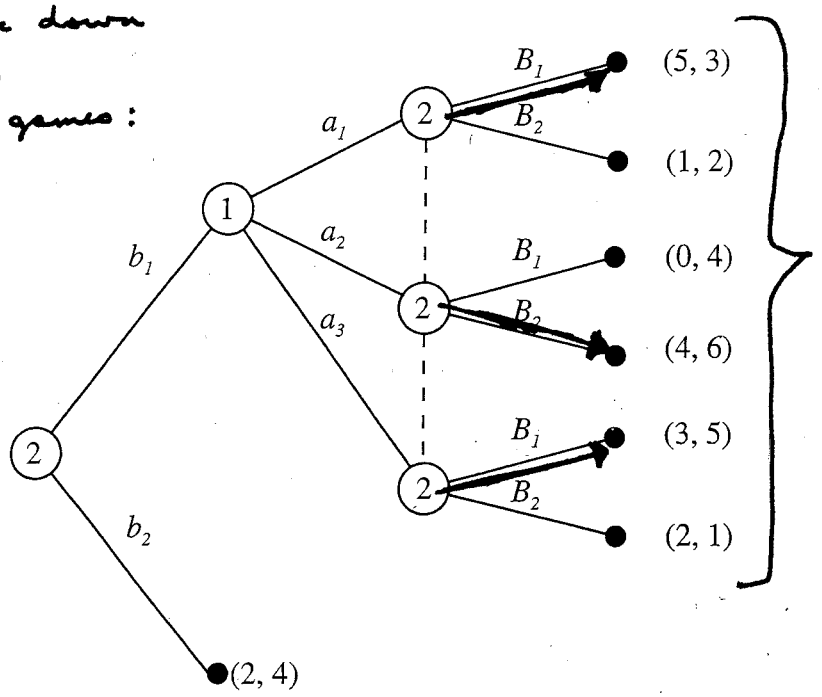
R3 is never the best response by the row player, so it can be eliminated from consideration.

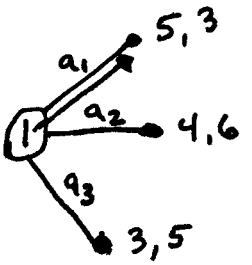
In the remaining payoff matrix, the column player would never play C4 in response to the row player's possible strategies of R1, R2, and R4.

In the remaining 3×3 payoff matrix, the only strategy pair where each player's strategy is a best response to the strategy chosen by the other player is R4-C3. That is a Nash equilibrium.

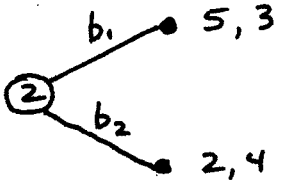
6. (15 pts.) Players 1 and 2 play a sequential game. Player 2 moves first, then player 1 moves second, and finally player 2 moves again. Their strategy choices and payoffs are illustrated in the game tree below. Note that player 1's payoff is listed first and player 2's payoff is listed second.
   a) What do you predict the outcome of the game will be? Explain why.
   b) Suppose player 1 tells player 2 that she will play a_2 on the second move if he plays b_1 on the first move. Now what do you predict will be the outcome of the game? Why?

(a) break down into subgames:





so the game reduces to:



and player 2 will choose b_2.

(b) Player 1's promise to play a_2 on the second move is not credible, because once she is put in that position she will act in her best interest and choose a_1, leaving player 2 with a payoff of 3. To avoid that outcome, player 2 will stick with the original strategy choice of b_2.

7. (10 pts.) What did William the Conqueror and Cortes both do, and why was it a successful strategy?

William the Conqueror and Cortez both burned their ships after landing on the shores of England and Mexico. Having no avenue of escape or retreat, their soldiers fought harder than they would have if they had the alternative of getting back on the ships and sailing home.