Economics 431
Fall 2003
Final Exam
December 18, 2003

Print your name here ____

Your UM ID number[1] ___________________________________

Instructions:

- Do not open the exam until you are told to do so.
- *Once the exam begins*, check that you have all the pages. There should be 13 pages including this one.
- *Once the exam begins*, print your name in capital letters on top of each page to receive credit for it.
- This is a closed book, closed notes exam.
- You have 100 minutes (1 hour and 40 minutes) to take the exam.
- Answer the questions in the space provided. To get credit on word questions, you should provide a brief explanation of your answer. Please write concisely and to the point. Feel free to use diagrams, but label them properly. If your answer involves doing math, show all work (this way you will get partial credit in case your ideas are correct but your math is not).
- If you run out of space on a particular question, you may use the back side of the same page. Clearly indicate on the front of the page that your answer is on the back; and on the back, give the number of question you are answering.

Good Luck!

[1] The underlined 8 digits on the face of your M-Card

1) (25 points) Consider repeated labor disputes between the union (Player 1) and the employer (Player 2) that are modeled as an indefinitely repeated game. Each period, the players simultaneously choose whether to hire a lawyer (L) or negotiate without one (N). Hiring a lawyer is costly, and it improves the chances of winning the dispute only if the other side does not have a lawyer. Formally, the stage game is given by a payoff matrix

	L	N
L	$5,5$	$8,2$
N	$3,7$	$6,6$

a) **(5 points)** Find all the Nash equilibria of the stage game. Which players, if any, have a dominant strategy?

b) **(15 points)** Now suppose that the discount factor for both players is equal to δ. Write down a complete description of the simplest possible strategy (for both players), such that the action profile (N, N) is played every period in a subgame perfect equilibrium. For what values of δ the strategy you described is a subgame perfect equilibrium? For full credit, you should check for all relevant deviations.

c) **(5 points)** Based on your results, when labor disputes arise frequently, is it more likely or less likely that they are resolved by negotiation? Explain.

2) (25 points) Consider an industry with more than two firms and assume that it can be described by a Cournot oligopoly game. True or false:

a) **(7 points)** If all firms have identical constant marginal costs and zero fixed costs, no two firms will have an incentive to merge.

b) **(5 points)** If the motive for merger is saving on the fixed costs, then consumers are worse off from this merger.

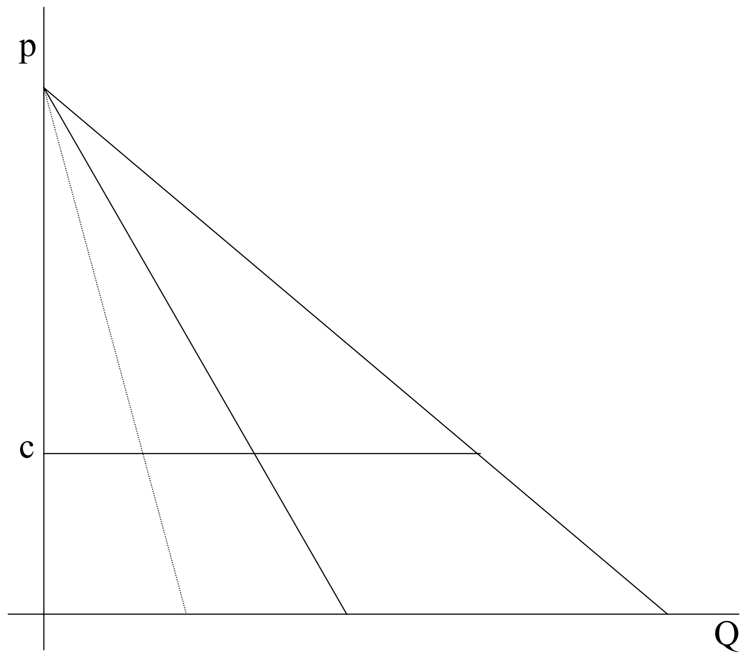
c) **(7 points)** Suppose that some firms in the industry have high marginal costs (c_H) and others have low marginal costs $c_L < c_H$. Then a merger between two low-cost firms is always more profitable than the merger between a low-cost and a high-cost firm.

d) **(6 points)** Now assume that the industry is no longer described by the Cournot model. Initially, there are several big firms (leaders, as in Stackelberg game) and several small firms (followers). Two follower firms decide to merge in order to become another leader firm. Describe under what circumstances this merger benefits consumers.

3) (35 points) There is a monopoly manufacturer and a monopoly retailer. Demand for the retail product is

$$p = 12 - Q.$$

This demand and some other lines are shown on the diagram. Marginal cost of the manufacturer is constant and equal to $c = 4$. The manufacturer charges the retailer a uniform wholesale price r.



a) **(15 points)** Clearly show the following on the diagram and mark it as instructed:

(2 points) Retailer's demand for the manufacturer's product and label it $r(Q)$;

(2 points) Manufacturer's marginal revenue line and label it $mr(Q)$;

(2 points) Profit-maximizing quantity for the manufacturer and label it Q^*;

(2 points) Wholesale price and label it r^*;

(2 points) Retail price and label it p^*;

(5 points) If retailer and manufacturer were maximizing their joint profits, would they still choose to produce Q^* or some other quantity? Calculate this quantity, show it on the diagram and label it Q_M.

b) **(3 points)** There are various ways to force the retailer to sell Q_M rather than Q^*. One way is a contract that forbids the retailer to charge more than $\bar{p}$ (a price ceiling). Calculate $\bar{p}$.

c) **(8 points)** What other contracts between the manufacturer and the retailer can achieve a bigger joint profit for them? Describe at least three other arrangements.

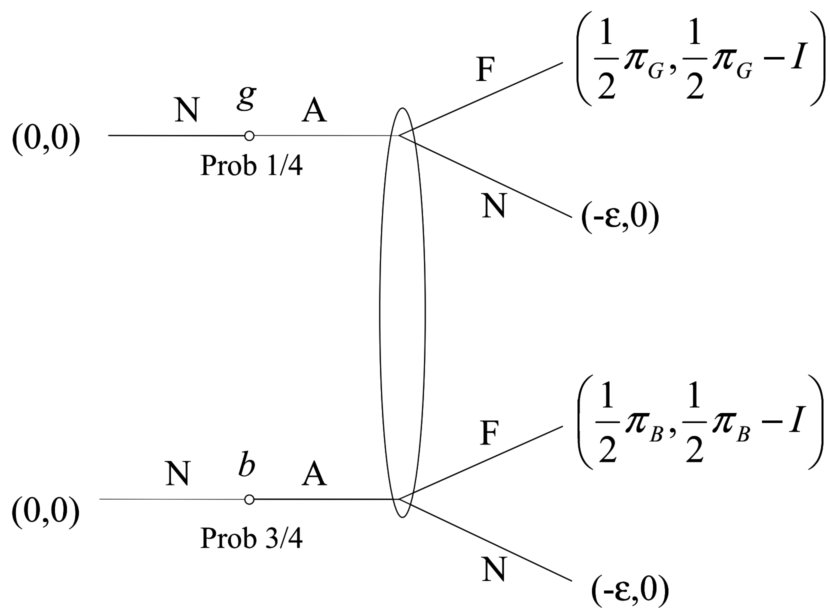
d) **(9 points)** In part b), a price ceiling was used to improve the joint profits of manufacturer and retailer. Another very common agreement between manufacturers and retailers is a price *floor* (also known as resale price maintenance agreement). Explain when this restriction is used and why it may improve the manufacturer's profits from a franchise contract. (Hint: you do not have to assume monopolistic retailer).

4) (15 points)

a) **(6 points)** Suppose that the monopolist maximizes profit by choosing the price for the good and the amount of "persuasive" advertising. Then, at the profit maximum, which of the following will have a larger impact on quantity demanded: a 1% cut in price or a 1% increase in advertising? Explain. (Hint: how does the price elasticity of demand η_P compare to the advertising elasticity of demand η_S?)

b) **(9 points)** Assume that the monopolist has total sales (i.e. revenue) of $ 60 million, spends $ 5 million on advertising and makes a profit (net of advertising expenditures) of $ 15 million. Calculate the price elasticity of demand, η_P, and advertising elasticity of demand, η_S.

5) (35 points) Consider a game between the entrepreneur (Player 1) and the investor (Player 2). The entrepreneur needs an investment of $I = 90$ to implement a project and promises to repay the investor with one half of whatever profits the project generates (this is called equity financing). The project can be either good or bad. It is good with probability $\frac{1}{4}$ and bad with probability $\frac{3}{4}$. A good project generates a payoff $\pi_G = 200$, and a bad project generates a payoff $\pi_B = 80$. The entrepreneur knows whether the project is good or bad, but the investor does not. The investor has to decide whether to finance the project or not (F or N), based on his beliefs about the quality of the project. The entrepreneur decides whether to apply for financing (A or N), depending on the quality of his project. There is a small application cost $\varepsilon > 0$ that the entrepreneur pays if he applies but is not funded.



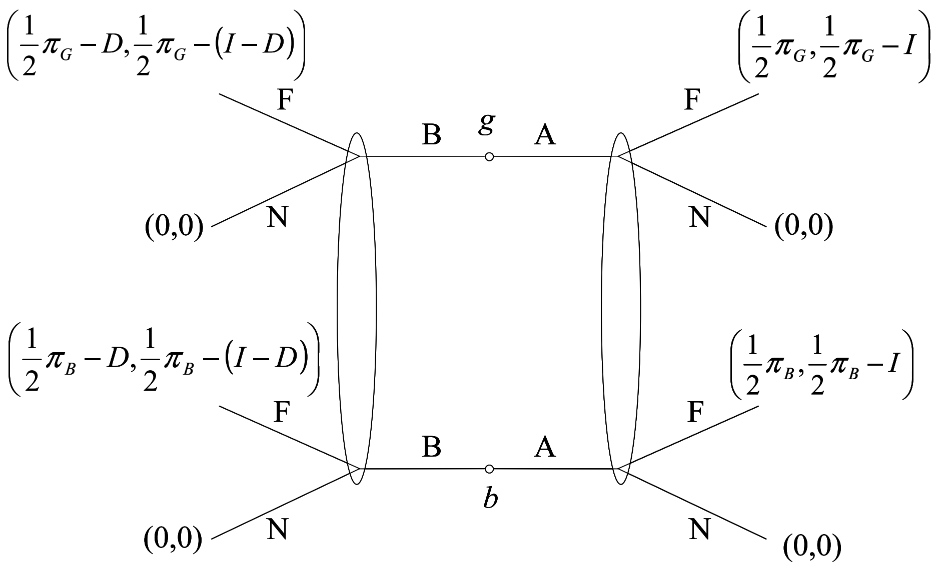
a) **(3 points)** In terms of the sum of payoffs, which project(s) is it efficient to fund? Explain.

b) **(6 points)** Is there an equilibrium where only the good project is funded? Explain

c) **(6 points)** Is there an equilibrium where both projects are funded? (Hint: if both entrepreneur types apply, what is the investor's expected payoff from funding the project?)

d) **(8 points)** What is the equilibrium of this game?

e) **(12 points)** Now suppose that the entrepreneur has two sources of funding. As before, he can ask the investor for $I = 90$ and promise $\frac{1}{2}\pi$ in return (i.e. choose action A). Alternatively, the entrepreneur can take action B - borrow an amount $D < 90$ from the bank (a debt which he has to repay regardless of the profitability of his project), and then ask the investor to put up the rest of the funds, $I - D$, in exchange for a promise to pay $\frac{1}{2}\pi$. The investor does not observe the quality of the project, but he does observe what action is taken by the entrepreneur. Formally, the actions and payoffs are depicted on the figure below. Assume that the application cost ε is zero. Find an equilibrium where the good type borrows (takes action B) and the bad type does not (takes action A). How much must the good type borrow in this equilibrium (that is, find all the values of D consistent with this separating equilibrium)? Explain why funding part of the project with debt is a good signal for the investor.



Reference Guide

Present value calculations

$$1+\delta+\delta^2+...=\frac{1}{1-\delta}$$

$$\delta+\delta^2+\delta^3+...=\frac{\delta}{1-\delta}$$

Cournot game between N identical firms with marginal cost c
Demand

$$p=A-BQ$$

Equilibrium profit

$$\pi\left(N\right)=\frac{(A-c)^2}{B\left(N+1\right)^2}$$

Monopolist in a market with linear demand

$$Q=\frac{A-c}{2B},\ p=\frac{A+c}{2}$$

Monopolist that chooses price (p) and advertising (S)

$$\pi=\max_{p,S}\left[\left(p-c\right)Q\left(S,p\right)-\tau S\right]$$

Inverse elasticity rule

$$\frac{p-c}{p}=\frac{1}{\eta_P}$$

Dorfman-Steiner condition

$$\frac{\tau S}{pQ}=\frac{\eta_S}{\eta_P}$$