FINAL EXAMINATION
(Tuesday, December 12, 2000)

NOTE : THIS WAS AN IN-CLASS EXAM

Directions: This is a closed-book exam. <u>Please print your name clearly on each answer book</u>.

Answer all questions as clearly and legibly as possible. The exam has a total of 420 points; the number of points and a suggested amount of time is indicated for each question.

<u>For numerical problems, please draw a box around your answer.</u>

<u>You must turn in this exam along with your answer books before leaving the room</u>.

Students in the 8:30 a.m. section:

I <u>will not</u> discuss the contents of this exam with <u>anyone</u> in other sections before 1:00 p.m.

Students in the 10:30 a.m. and 11:30 a.m. sections:

I <u>have not</u> discussed the contents of this exam with anyone who took it earlier this morning.

Signed: _____

Print your name: _____

1. *(105 points; 18 minutes)* Decide whether each of the following statements is **True**, **False**, or **Uncertain**, and give a **brief but clear explanation** of your answer. (Most of the credit will be given for the explanation.)

1a) *[Note: This problem is not covered this year.]* It has been argued that the Internet has increased the magnitude of the price elasticity of demand for many products (by reducing consumers' search costs) and has increased the effectiveness of advertising expenditures (by improving firms ability to target advertising expenditures to inform specific groups of consumers.) *In response, advertising budgets should be expected to increase.*

1b) Consider a market with three firms, each producing a homogeneous product. Demand for the product is downward sloping. Each firm has the same cost structure, with equal (and constant) marginal costs of production. If one firm is maximizing its profits subject to the output levels of the other firms, the three firms as a group are not maximizing industry profits.

1c) Epidemiological studies have indicated that 5% of America's domesticated cats are hospitalized each year, with the average cost of hospitalization now being $600. A new firm, Blue Cross/Blue Cat has just been formed and it plans to offer the country's first hospital insurance policy for cats. The company estimates that the administrative costs per policy will be $10 per year. If Blue Cross/Blue Cat offers a cat hospital insurance policy having an annual premium of $40, it can expect just to break even (earn zero economic profits).

2. . *(75 points; 12 minutes)* Two drug companies, **Murcky and Pfizzier**, are each considering releasing a new drug for clinical trials. Each company knows that the other also has a drug sufficiently developed so that clinical trials *could* begin. However, each company realizes that an extra six months of research will reduce some of the side-effects likely to occur in the present version of the drug. Unfortunately, being second to market means losing out completely. The payoff matrix, with all numbers representing millions of dollars, is as follows:

New Anti-ulcer drug

		Pfizzier	
		Now	Later
Murcky	Now	5,5	20,0
	Later	0,20	10,10

2a) Does either company have a dominant strategy?

2b) What is the Nash equilibrium of the game?

2c) Suppose that the Federal Drug Administration imposes severe retesting requirements that impose expected costs of $X million for releasing a drug early.

How does this change the payoff matrix? How high does the fine need to be to ensure that *both* companies do the extra six months of research? You may assume that X is a whole number.

3. *(120 points; 25 minutes)* The Museum of Black Velvet Paintings has hired you to set its admission prices. There are two types of people who live in the museum's area: Black Velvet Connoisseurs (BVCs), who love black velvet paintings, and Black Velvet Philistines (BVPs), who are less enchanted with black velvet paintings.   The demand of each BVC is estimated as

$$Q_1 = 20 - 2P$$

where Q is number of visits per year and P is in dollars per visit.   The demand of each BVP is estimated as

$$Q_2 = 10 - P$$

There are 1,000 BVCs and 10,000 BVPs in the local population. Also, the Museum faces a marginal cost of zero per visit.

3a) Suppose that the Museum has a single admission price for all patrons. Assuming that the Museum has no competitors, what price would maximize its profits, and what would profits be?

3b) Some of the more elitist Museum trustees argue that the Museum should only serve BVCs, and that the Museum should consider charging an annual membership fee and/or an admission fee per visit. Namely, to visit the Museum one must pay an annual membership fee and the per-visit admission fee. What admission fee and/or annual membership fee should the Museum charge to maximize profits from BVCs (while not attracting BVPs)? What are profits here?

3c) Other trustees just want to maximize profits, and they feel that offering memberships to all interested patrons may be the best way to do that. Namely, to visit the Museum one must pay an annual membership fee, but then all visits during the year are free. In this case, what is the annual fee that maximizes profits for the Museum? Be sure to indicate which groups (BVCs, BVPs or both) choose to become members. What are total profits?

4. *(120 points; 25 minutes)* Your company monopolizes the production of an automated trash sorting system for upscale kitchens. Your system has certain type of servo-

mechanism as a key part; there is one servo per system. Q denotes the number of servos in thousands, or equivalently the number of sorting systems in thousands. Demand for the sorting system is given as

$$P = 1120 - Q$$

where P is in dollars per system. Given the servo, there are additional costs of $900 to assemble the sorting system. Your firm has three fabrication plants for servos; their marginal cost structures are given as

$$MC_1 = 20 Q_1$$

$$MC_2 = 10 Q_2$$

$$MC_3 = 5 Q_3$$

4a) Show that net marginal revenue for servos is given as

$$NMR = 220 - 2 Q$$

That is, show your derivation of net marginal revenue for servos from the production of sorting systems.

4b) Suppose that there is a competitive outside market for servos, where servos can be purchased or sold for $ 100. What are the optimal production levels Q_1, Q_2, Q_3 for your three servo fabrication plants, how many sorting systems Q should you produce, and how many servos should be bought or sold in the outside market? (Hint: what is the optimal transfer price?)

4c) Suppose instead that the competitive outside market servos (that cost $ 100) are not durable enough for your sorting systems; they require a $ 20 refit per servo to bring them up to standards. Also, suppose that servos produced in your own plants can be sold outside for $110, because of their higher quality. View the $110 selling price as fixed regardless of quantity sold.

What are the optimal production levels Q_1, Q_2, Q_3 for your three servo fabrication plants, how many sorting systems Q should you produce, and how many servos should be bought or sold in the outside market? (Hint: what is the optimal transfer price?)