Name:

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All questions must be answered on this test form!
For each question you must show your work and (or) provide a clear argument.
Write you answers in the boxes.
For scratch paper use the back of the form or the last page.

Question 1 On a University campus the cost of parking per day is \$5. If you don't pay and the meters are enforced, you pay a fine of \$15. The cost of enforcing the meters is $c > 0$ per car. Your choice is whether or not to pay. The choice of the University is whether or not to enforce. The payoff matrix is as follows:

University

You		enforce	don't enforce
	pay	-5,5-c	-5,5
	don't pay	-15,15-c	0,0

(a) In the Nash equilibrium, *10 points*

The expected payoff of the University is

(b) Now the University decides that it will always enforce (independent of whether or not people pay). If you behave optimally, then compared to (a) *4 points*

The expected payoff of the University changes by

(*Note:* A positive number denotes an increase, a negative number a decrease).

Question 2

(a) A firm has a cost function $c(y) = 1,000 + 40y$. The demand for the firm's product is $D(p) = 1,000 - 10p$. This demand function would arise if there are 100 consumers that all have the same preferences $u(Q, m) = 100Q - 5Q^2 + m$, where $Q = y/100$ is an individual's consumption of the firm's output, and m is money spent on all other goods. Suppose each person's income is $I = 10,000$. Then *8 points*

The firm will charge a price p =

The firm's profit is

A consumer's utility is

(*Note:* m is the amount of money a consumer has left after purchasing y units of the firm's product).

(b) Now suppose that the government introduces a tax of 10 Dollars per unit on the firm. Thus, costs are now $c(y) = 100 + 50y$ (the demand function and utility function remain the same). Then *8 points*

The firm will charge a price p =

The firm's profit is now

The government's total tax revenue is

A consumer's utility is

If we add the change of utility (times 100, i.e., the number of consumers), the firm's change in profit, and the tax revenue then we get the dead weight loss of the tax (be careful not to forget the positive or negative sign of the change).

The dead weight loss generated by the tax is

Thus, for each Dollar of taxes raised, the loss is cents

Question 3 The profit of a firm is given by $f(e) = 50e - e^2$, where e is the manager's effort. The manager's cost of effort is given by $c(e) = e$. The manager receives a share s of the firm's profit as compensation, i.e., the compensation is $sf(e)$. Including the cost of effort, the manager's net-payoff is $sf(e) - c(e)$. The owner of the firm receives $f(e)$ minus the payment to manager, i.e., $f(e) - sf(e)$.

(a) Currently the manager receives a share $s = 0.05$ of the firm's profit. However, the owner is not satisfied with the manager's effort and the firm's profit and considers increasing the manager's compensation to $s = 0.1$. *7 points*

If $s = 0.05$, the owner's payoff is

If $s = 0.1$, the owner's payoff is

(b) Now assume that the manager can falsely report higher profits by using some accounting tricks. In particular, the firm's reported profit can be increased by $200\sqrt{t}$ at a cost of t. Reported profit is therefore $f(e) + 200\sqrt{t}$ and the manager receives $s(f(e) + 200\sqrt{t})$ as payment, and has total costs $c(e) + t$. The payoff to the owner is $f(e)$ minus the payment to the manager. If e and t are chosen optimally by the manager, then *7 points*

If $s = 0.05$, the owner's payoff is

If $s = 0.1$, the owner's payoff is

Question 4 Assume there are two types of workers, h, and l that are seeking a job from a firm. Type h workers are more productive than type l workers, but the firm cannot distinguish them at the outset. For simplicity assume that both types only work for two periods. A worker's utility is $\sqrt{x_1} + E[\sqrt{x_2}]$ where x_1 is the worker's wage in the first period, and $E[\sqrt{x_2}]$ denotes the worker's expected utility of the wage in the second period (e.g., if the worker receives wage x_2 with probability p and x_2' with probability $1-p$ then $E[\sqrt{x_2}] = p\sqrt{x_2} + (1-p)\sqrt{x_2'}$.)

(a) Assume that after one period, the firm's manager receive a signal about the worker's ability. If a worker is of type h then at the beginning of the second period the signal will be good with probability 0.8, and bad with probability 0.2.

Suppose that workers can choose one of the following schedules.

1. A wage of 72,900 in each of the two periods.
2. A wage of m Dollars in the first period. If after the first period, the firm receives the good signal about a worker, then the worker receives m Dollars again in the second period. Otherwise, the worker is fired and receives 0.

Assume that m is chosen such that a type h worker is just indifferent between the two wage contracts. Then *6 points*

***m* =**

(b) Instead, assume that the firm only wants to hire type h workers. Assume that both type h and type l workers can always find another job that pays 40,000. The firm offers the following wage contract. A wage of 10,000 in the first period. In the second period, the wage is 40,000 if the the signal is bad, and the wage is m if the signal about the worker is good.

Assume that m is chosen such that a type h worker is just indifferent between signing up for this contract or getting a wage of 40,000 each period in the other job. Then *6 points*

***m* =**

Question 5 The demand functions for a firm's product in countries A and B is given by $y_A(p) = 200 - p$ and $y_B(p) = 300 - 10p$, respectively. The firm's cost function is $c(y) = 20y + 1,400$, where $y = y_A + y_B$ is the total amount of the product sold in both countries. Assume that the firm can charge different prices p_A and p_B in the two countries. Then *12 points*

In country *A* the price is p_A =

In country *B* the price is p_B =

Question 6 NW airline offers service between two cities A and B at a cost $c(y) = 150y + 10{,}000$, where y is the number of passengers. The price elasticity of demand is -1.2. Another airline enters the market. As a consequence, consumer demand becomes more elastic, and the elasticity is now -2. As a consequence *9 points*

NW lowers the price from \$ to \$.

Question 7 Consider the following game:

		Player B: L	Player B: R
Player A	U	5,8	4,9
	D	6,2	2,3

Determine the Nash equilibrium (pure or mixed strategies, whichever exists). *8 points*

In the Nash equilibrium *A*'s (expected) payoff is

Question 8 Suppose there are three types of people A, B, and C in a population of 1 Million. Type A people have a probability of 0.01 of becoming seriously ill. For type B the probability is 0.2, and for type C it is 0.9. The medical costs from being treated for the illness is \$30,000. The maximum willingness to pay for insurance is \$400 for type A, \$8,000 for type B, and \$27,500 for type C. Also, assume that 90% of the population are type A, 8% are type B and 2% are type C. The type is private information, i.e., only each person knows their true probability of becoming ill, but not the insurance company. The insurance company has a fixed cost of 20 Million Dollars.

(a) Suppose that insurance is mandatory (everyone must be insured). Because of government regulation the company must provide insurance at a premium such that profits are exactly zero. Then *6 points*

The insurance premium is

(b) Now suppose that insurance is voluntary. Determine the premium (price of insurance) that maximizes the profit of insurance company (profits could be negative). *8 points*

The insurance premium is

The insurance companies' total profit is

If profits of the insurance company must be positive for insurance to be offered then

% of the population will be insured.

Scratch Paper, not graded!