

Massachusetts Institute of Technology
Department of Economics

14.01 Principles of Microeconomics

Final Exam

Last Name (Please print): _____

First Name: _____

Instructions. Please read carefully.

The exam has a total of 173 points. Answers should be as concise as possible. This is a closed book exam. You are not allowed to use notes, equation sheets, books or any other aids. You are not allowed to use calculators. You must write your answers in the space provided between questions. Fractional answers are permissible in any part of this exam. DO NOT attach additional sheets of paper. This exam has 22 pages (17 pages + 5 blank pages for scratch work)

DO NOT WRITE IN THE AREA BELOW:

Question 1 __/48

Question 2 __/20

Question 3 __/45

Question 4 __/40

Question 5 __/20

Total __/173

1. True/False/Uncertain and Short Questions (48 points)

In this section, write whether each statement is true, false or uncertain or answer the question that is posed. You should fully explain your answer, including diagrams where appropriate. Points will be given based on your explanation.

- (a) (4 points) A uniform pricing monopolist has an upward sloping MC curve. Claim: a price ceiling set below the monopoly price will increase welfare relative to the monopoly outcome (assume the monopolist does not shut down).

- (b) (4 points) A large box of paper towels which will last you 2 years is on deep discount at Wal-Mart, saving you \$1 per roll. Claim: a rational consumer who has perfectly inelastic demand for paper towels should always purchase this large box instead of paying a higher price for individual paper towel rolls.

(c) (4 points) In an oligopolistic market with identical firms, the market price is higher when there are two firms in the market than when there are 100 firms in the market.

(d) (4 points) The government of a developing country is worried about the adverse effect that the high interest rate in the economy has on investment. Claim: Since a low interest rate makes more projects have positive NPV, investment in this economy will increase if the government imposes an interest rate cap.

- (e) (8 points) There are three individuals in society: Bob, Milton and Paul. There are three possible social states which result in different utility levels for the three individuals:

	Bob	Milton	Paul
A	12	50	10
B	20	20	20
C	15	15	15

Are the following True/False/Uncertain? Explain.

- (i) No government would choose social state C.

- (ii) There is a government election in this society and there are two candidates: a Rawlsian and an Utilitarian government candidates. Claim: In a democratic election (majority win election) a Utilitarian candidate will be elected since more individuals in this society prefer the Utilitarian candidate.

- (f) (8 points) Jon spends his entire budget on espresso and gasoline. You have the following data on his choices:

Table 1: Jon's budget

	Price/ gallon gasoline	Price/ shot espresso	Gallons purchased	Shots purchased	Total income
February	2	1	9	4	22
March	5/2	3/4	10	8	31
April	3	1/2	8	14	31

Assume Jon's preferences are monotone, the same over the three months, and that he has no way to save or borrow across periods. Are Jon's choices consistent with utility maximization?

- (g) (4 points) Marco's monthly income is \$1000. He spends 40% of his income on food and the rest on buying designer clothes. The City Council thinks it is unfair that people spend more than 35% of their income for food. In order to lower the proportion of income going to food, the City Council gives Marco \$200. Claim: given that Marco's income elasticity of food is 2, the City Council accomplishes its goal.

(h) (4 points) Venus Williams likes both tennis rackets and tennis shoes. She has many of both. Her marginal rate of substitution (MRS) of rackets for shoes is 3, meaning that given the opportunity, she is willing to trade 3 tennis rackets for 1 pair of shoes, or vice versa. Unused rackets and shoes may be returned to the local sporting goods store for a refund. The current price for a racket is \$200 and the price for a pair of shoes is \$100. Claim: Venus can make herself better off by trading in some tennis rackets in return for some shoes at the market rate.

(i) (4 points) Suppose that there are two types of drivers: speeders and slowpokes. Speeders are more likely to have accidents, and have expected costs of \$5,000 a year in car repair bills. Slowpokes on the other hand have expected costs of only \$100 a year. Suppose further that speeders are risk-loving and that slowpokes are risk-averse. Claim: a (risk-neutral) private car insurance company will insure only slowpokes even if there are no asymmetric information or moral hazard problems in this market.

- (j) (4 points) Please outline the pros and cons of the U.S. adopting a tax system with a heavier reliance on a consumption tax.

2. Uncertainty (20 points)

An economy has two agents, Bill and Bob. Bill has \$110, and Bob has \$200. Utility of agents in this economy is characterized by the following function of income:

$$U = u(y) = \begin{cases} \log(y - 60) & \text{if } y < 160 \\ \frac{1}{80}y & \text{if } y \geq 160 \end{cases}$$

The minimum level of income possible in this economy is 60.

Each agent is about to choose a new business venture, and has a choice between project A and project B. Neither project requires any investment up front. Project A yields revenues of 20 with probability $\frac{1}{2}$ and revenues of -10 with probability $\frac{1}{2}$. Project B yields revenues of 4 with probability one-half and revenues of 5 with probability one-half. Throughout this problem, assume that fractional income is possible.

- (a) (5 points) Which project would each agent choose? Provide intuition for your answer.

- (b) (5 points) If Bill and Bob each choose an investment project each year and receive the associated income for 20 years, will the expected gap in their incomes be larger or smaller at the end of this period than it was initially? How does this relate to attitudes toward risk? You do not need to calculate income over 20 years, just provide intuition.

- (c) (10 points) Now, assume that there is a job available that provides fixed wage income. What salary would the job have to provide in order to induce Bill to take the job rather than entering a new business venture? What salary would the job have to provide in order to induce Bob to take the job? Which is higher, and why? Algebraic expressions are acceptable as answers.

3. Costs and oligopoly (45 points)

A firm produces output q using capital and labor inputs according to the production function:

$$q = f(K, L) = 4K + 2L$$

Capital and labor are both supplied in perfectly elastic input markets at prices of $r = 4$ and $w = 4$.

- (a) (5 points) Draw a representative set of isoquants for this firm. On the same graph, draw and label the firm's expansion path at these prices of capital and labor.

(b) (5 points) Find the factor demands for capital and labor as functions of output.

(c) (6 points) Derive an expression for the firm's total cost as a function of q .

(d) (8 points) Suppose that in this market, our original firm competes with one other identical firm, and that both firms set their quantities at the same time. Furthermore, inverse demand for q is given by $p = 7 - q$. Regardless of what you found in part (c), you should now assume that both firms produce at a constant marginal cost of 1. Find the equilibrium price as well as the quantities and profits for each of these duopolists.

(e) (6 points) What is the maximum amount that an outside investor would be willing to pay to purchase one of these firms? Explain.

(f) (8 points) What is the maximum amount that duopolist A would pay to acquire firm B before quantities are set? Explain intuitively why firm B is worth more to its competitor than to an outside investor.

(g) (7 points) Suppose instead that the two firms were competing on price, a la Bertrand. How much would an outside investor be willing to pay for firm B? How much would firm A have paid?

4. Labor supply and income and substitution effects (40 points)

There are three periods, $t = 0, 1, 2$. In $t = 1$ Mary maximizes her utility over leisure and consumption given the following function:

$$U_1(N_1, C_1) = N_1^{\frac{1}{2}} C_1^{\frac{1}{2}}$$

subject to the following budget constraint:

$$C_1 + w_1 N_1 = 24w_1$$

where $w_1 = 10$. Note the price of the consumption good is assumed to be one in all periods. After she has made this decision, in $t = 2$ she maximizes this utility function:

$$U_2(N_2, C_2) = N_2^{\frac{1}{3}} C_2^{\frac{2}{3}}$$

subject to the following budget constraint:

$$C_2 + w_2 N_2 = 24w_2$$

where $w_2 = 20$.

- (a) (6 points) For $t = 1, 2$ calculate Mary's choice of leisure and consumption in each period.

- (b) (6 points) For $t = 1$, provide economic intuition for the income and substitution effects of a wage increase on leisure. Can you say anything about the relative magnitudes of these income and substitution effects?

(c) (7 points) Go back to your solution in part (a). If the interest rate is 10% per period, what is the present value of her consumption in $t = 0$? Please use 0.9 and 0.8 as approximations for $1/(1.1)$ and $1/(1.1)^2$ respectively.

(d) (7 points) Mary now has the option of obtaining additional job training in $t = 0$ at an investment cost of \$200. As a result, her wage rate increases in $t = 1$ to $w_1 = 20$ and in $t = 2$ to $w_2 = 30$. Calculate the net present value of this investment on consumption. Consider only the value of consumption (and not the value of leisure).

(e) (7 points) For more general utility functions, when will the net present value of the investment on consumption from part (d) likely be negative? Use income and substitution effects in your explanation.

(f) (7 points) Does Mary have a Laffer curve for income taxes (as opposed to consumption taxes)?

5. Trade and price discrimination (20 points)

A U.S. pharmaceutical firm sells its patent-protected drug Levemir in the U.S. and E.U. markets. The domestic demand function is $Q_{US} = 120 - 2p_{US}$, and the E.U. demand function is $Q_{EU} = 60 - p_{EU}$, where all prices are measured in U.S. dollars and quantity is measured in vials. The firm's marginal cost is $MC = 10$ in both countries.

- (a) (6 points) Initially, the U.S. and E.U. governments prevent resale of Levemir. What are the firm's optimal p_{US} and p_{EU} ? (The same price has to be charged to all consumers in the U.S. market and all consumers in the E.U. market.) How many vials does it sell in the U.S. and E.U. markets?

- (b) (6 points) Now assume that the U.S. and E.U. governments permit resales and per unit transportation and other transaction costs are negligible, so that the pharmaceutical monopoly can no longer price discriminate. What price will the firm charge and how many vials will it sell in the U.S. and in the E.U. markets?

- (c) (8 points) Use one graph for the U.S. market and one graph for the E.U. market to show the welfare impacts of the policy change in (b). What happens to consumer and producer surplus in each nation? Overall, is this a social welfare improvement or reduction? Please provide intuition for the overall welfare impact.

END OF EXAM

BLANK PAGE

BLANK PAGE

BLANK PAGE

BLANK PAGE

BLANK PAGE

MIT OpenCourseWare
<http://ocw.mit.edu>

14.01SC Principles of Microeconomics
Fall 2011

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.