

Econ Honors: Final Exam (Anthony Yuen)
Dec 17, 2007

Instructions:

- This is a 120-minute examination.
- Write all answers in the blue books provided. Show all work. Use diagrams where appropriate and label all diagrams carefully.
- Write your name and your Recitation Instructor's name in every blue book that you use.
- This exam is given under the rules of Penn's Honor system.
- All blue books, blank or filled, must be handed in at the end of this exam. No blue books may be taken from the room.
- The use of Programmable Calculators is in violation of Departmental rule. It is strictly forbidden!

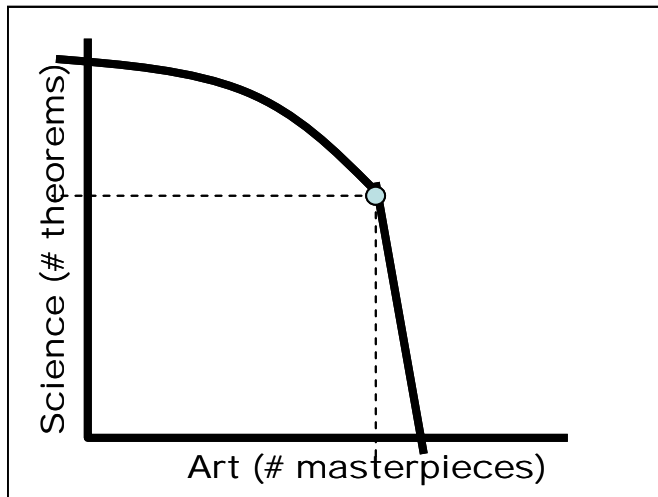
Check: The Exam has 2 parts.

Part 1 consists of 14 multiple-choice questions. Please write your answers in blue book 1.

Part 2 consists of 3 short answer questions.

Part I: Multiple Choice Questions (3 points each/42 points total):

1. Man has 1000 units of genius that he can use to produce art masterpieces and science theorems. Man's PPF has the following shape:



The marginal opportunity cost of Art (in terms of theorems) will be:

- a. Negative
- b. First increasing and then constant
- c. First constant and then increasing
- d. First constant and then diminishing

2. The country of Sweetland can produce candies and shoes. We know that Sweetland exports candies to the rest of the world and import shoes. If we know the Production Possibilities Frontier (PPF) of Sweetland, what can we say about its Consumption Possibilities Frontier (CPF)?
 - a. We know the maximum amount of shoes that Sweetland can consume.
 - b. We know the maximum amount of candies that Sweetland can consume.
 - c. Both a and b are correct.
 - d. Neither a nor b are correct.

3. Suppose Sweetland has the absolute advantage in both goods around the world. Assume that Sweetlanders want candies and shoes and no other product. Which of the following is true?
 - a. Sweetland should not trade with other countries since it is the best in both goods; trade creates no benefit for its citizens.
 - b. Sweetland should export both goods to the rest of the world since it is the best in both goods.
 - c. Sweetland should export either shoes or candies but not both.
 - d. None of the above is true.

4. A common stereotype is that women buy more shoes than men. Suppose that you have the following information concerning the supply and demand for shoes (all units are in pairs):

Women's supply and demand for shoes:

$$Q_s(w) = -10 + P(w)$$

$$Q_d(w) = 50 - 2 P(w)$$

Men's demand for shoes:

$$Q_d(m) = 30 - P(m)$$

The supply curve for men's shoes is not given, but you are told that at equilibrium, $P(w) = 2 * P(m)$. That is, women's shoes cost twice the price of men's shoes. Which of the following is true?

- a. Women buy more shoes than men
- b. Men buy more shoes than women.
- c. They buy the same quantity of shoes.
- d. There is insufficient information to answer this question.

5. Which of the following could be an explanation of increase in price of Coke?
- Research suggests that Coke might cause cancer.
 - Coke builds a new factory in China that reduces the cost of producing coke.
 - Pepsi builds a new factory in China that reduces the cost of producing Pepsi (a substitute product).
 - Frito-Lay builds a new factory in China that reduces the cost of producing Frito-Lay chips (a complementary product).
6. Target is trying to maximize sales revenues from holiday shoppers. The store is considering putting a discount of 30% on ties and/or shirts. You find that demand for ties is elastic but that the demand for shirts is inelastic. You do not think that a sale on one item will affect the other. You will recommend to:
- Put ties on sale.
 - Put shirts on sale.
 - Put both on sale.
 - Put neither on sale.
7. In a market with no externalities, subsidies will always:
- Increase producer surplus.
 - Increase consumer surplus.
 - Cause dead weight loss.

Which of the above statements is correct?

- I, II & III are correct
- I & II are correct, III is not.
- I & III are correct, II is not.
- I is correct, but II & III are not.
- III is correct, but I & II are not.
- None of the above.

8. William has 12 hours a day he could use either for leisure or to work to earn income. Suppose his wage decreases, but there is no other change. What will happen to the budget line?
- It will shift in, but the slope will remain the same.
 - It will shift in only on the income axis.
 - It will shift in only on the leisure axis.
 - None of the above is true.
9. Rebecca decides to allow Daniel to open and operate a lemonade stand on her front lawn for a flat fee of \$3 that includes the rental of the table as well as an unlimited supply of lemonade and cups. The lemonade stand was in business for 2 hours and during that time Daniel's total revenues were \$10. At the end of the time he pocketed \$7. Which of the following is true?
- Daniel's economic profits were \$7.
 - Selling lemonade made sense in the short run but may not make sense in the long run.
- Only I is true.
 - Only II is true.
 - Both I and II are true.
 - Neither statement is true.

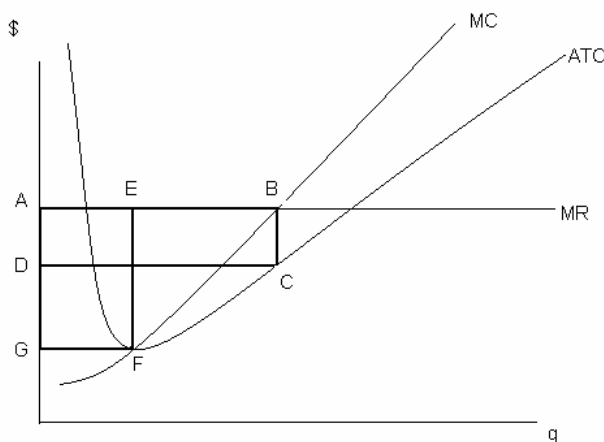
10. Suppose the detergent industry is perfectly competitive and all firms are identical. The market demand for detergent is given by $P = 60 - Q/10$, and each firm faces the same cost functions: $TC = 100 + q^2$ & $MC = 2q$. If there are 20 firms in the industry, the short run industry supply curve is given by:

- $Q_s = 10P$
- $Q_s = 20P$
- $Q_s = 10P - 60$
- $Q_s = \text{None of the above.}$

11. Using the information from the previous question, how many firms will be in the short run & the long run?

- In the short run: 20; In the long run more than 20.
- In the short run: 20; In the long run less than 20.
- In the short run: 30; In the long run more than 30.
- In the short run: 30; In the long run less than 30.

12. Which of the following is the correct relationship between the horizontal rectangle (ABCD) and the vertical rectangle (AEFG)? Note: Picture Not Drawn to Scale.



- $\text{area}(\square ABCD) > \text{area}(\square AEFG)$
- $\text{area}(\square ABCD) < \text{area}(\square AEFG)$
- $\text{area}(\square ABCD) = \text{area}(\square AEFG)$
- Not enough information

13. Which of the following statements is true:

I. Poverty as defined by the US census cannot, even theoretically, be decreased to zero.

II. A lower Gini ratio means lower inequality.

- a. I & II are true.
- b. I only.
- c. II only.
- d. Neither in true.

14. Game theory

		Player 2		
		L	M	R
Player 1	T	3, 3	0, 4	0, 0
	M	x, 0	1, 1	0, 0
	B	0, 0	0, 0	0, 0

“a” in (a, b) refers to player 1’s payoff and “b” refers to player 2’s payoff.

What should x be to make the cell (M, M) the equilibrium of choice?

- a. $x < 0$
- b. $x = 0$
- c. $x > 1$
- d. None of the above

ANS:

1. b
2. d
3. c
4. b
5. d
6. a
7. f (or a)
8. b
9. d
10. a
11. a
12. a
13. c
14. d

15. Notepad.Ink

Part II: Short Answer Questions

Q1. (20 points)

This question asks you to analyze the labor market of cranberry pickers. Cranberries are sold in a competitive market at \$25/barrel and firms hire cranberry pickers in a competitive labor market. The supply of cranberry pickers is given by $S_L: w=200+L$ and the demand $D_L: w=800-2L$. L denotes the number of workers hired and w denotes the weekly wage rate.

- a. Draw the supply and demand curve of labor. Why is the demand curve downward sloping? Explain.
- b. Calculate the equilibrium wage rate and employment level and label them on the graph which you have drawn for part a.
- c. The union claims that the cranberry pickers are being underpaid and wants the government to impose a higher minimum wage rate of \$ X per week. They realize this would lead to an unemployment level of 60 workers. Calculate X and show graphically the level of employment and unemployment on the same graph which you have drawn for parts a & b.
- d. The union is pleased with the wage rate of \$ X found above but wishes to decrease the unemployment. It decides to offer a training program to increase the productivity of the workers. Show graphically how this could reduce unemployment and still ensure higher wages. No need for exact numbers here.
- e. Suppose that there is no minimum wage and productivity has not improved. Nonetheless the union wants wages to be at X . Luckily a new study that shows the benefit of cranberry juice has increase demand for cranberries and as a result the price of cranberries has doubled. Will the union achieve the higher wages without unemployment? To get full credit you must answer numerically, but a graphical approximation will earn partial credit.

ANS:

This question asks you to analyze the labor market of cranberry pickers. Cranberries are sold in a competitive market at \$25/barrel and firms hire cranberry pickers in a competitive labor market. The supply of cranberry pickers is given by $S_L: w=200+L$ and the demand $D_L: w=800-2L$. L denotes the number of workers hired and w denotes the weekly wage rate.

- a. Draw the supply and demand curve of labor. Why is the demand curve downward sloping? Explain.

Answer:

Demand is downward sloping because firms hire labor up to the point where $w=MRP=MP(L)*P(\text{cranberries})$. $MP(L)$ is downward sloping due to the law of diminishing marginal productivity and hence the demand will be downward sloping.

Points: 4

1 for derived or $w=MRP$

1 for $MRP=MP(L)*P(\text{output})$

1 for $MP(L)$ diminishing

1 for law of diminishing marginal productivity.

- b. Calculate the equilibrium wage rate and employment level and label them on the graph which you have drawn for part a.

Answer:

Set $200+L=800-2L$ we get $L=200$ & $w=400$.

Points: 5

2 each.

Show on graph: 1

- c. The union claims that the cranberry pickers are being underpaid and wants the government to impose a higher minimum wage rate of \$X per week. They realize this would lead to an unemployment level of 60 workers. Calculate X and show graphically the level of employment and unemployment on the same graph which you have drawn for parts a & b.

Answer:

Set $L_s-L_d=60$ or $(w-200)-(800-w)/2=60$.

We get $w=440$ $L_s=240$ $L_d=180$ (note $L_s-L_d=60$ as needed)

Points: 4

Set up: 1 point

W, L_d & L_s : 1 point each (L_d & L_s can be graphically)

If only did graphically: 2 points

- d. The union is pleased with the wage rate of \$X found above but wishes to decrease the unemployment. It decides to offer a training program to increase the productivity of the workers. Show graphically how this could reduce unemployment and still ensure higher wages. No need for exact numbers here.

Answer:

Increased productivity would increase demand for labor. If we shift it enough we get $w=440$ without unemployment.

Points:3

Increased productivity would increase demand for labor:1

reduces unemployment:1

Shift in graph: 1

- e. Suppose that there is no minimum wage and productivity has not improved. Nonetheless the union wants wages to be at X. Luckily a new study that shows the benefit of cranberry juice has increase demand for cranberries and as a result the price of cranberries has doubled. Will the union achieve the higher wages without unemployment? To get full credit you must answer numerically, but a graphical approximation will earn partial credit.

Answer:

An increase in the price of the output will rotate demand for labor out and wages will increase.

To check numerically: $w_2=2(800-2L)=1600-4L$

We now get equilibrium where $1600-4L=200+L$ or $1400=5L$ $L^{}=280$ & $w^{**}=480>440$.**

Points:4

Rotation out of demand curve: 1 point.

Correct numerically: 1 point

Correct L & W: 1 point.

Graphical intuition of L & w: 1 point

Q2. (20 points)

Static analysis:

Suppose we have two firms refining oil into gasoline. One is Valero (V) and one is Sunoco (S). They compete in quantity (i.e., Cournot) simultaneously. If the market demand is $P = 10 - Q$, where $Q = q_V + q_S$, the marginal cost of producing gasoline is a constant c_V for Valero and c_S for Sunoco, then:

- a. [4 points] How many should Valero make? How many should Sunoco make?
- b. [4 points] What are the profits? (Please show your work for Valero)
- c. [6 points] Valero can build a consumer research function, say at individual gas stations, that can help it obtain advance market information, so that it can make production decisions faster. How much would Valero invest for that? (Please show work for Valero)

Dynamic analysis:

Suppose that the function needs $T = 2$ years to build. That is to say, from year $T = 2$ onward, Valero can always act faster than Sunoco every year. We are in year 0 now.

- d. [4 points] How much would Valero be willing to invest to build this function, if all of its investment has to be made in year 0 and the interest rate is r ?
- e. [2 points] Briefly describe which analysis is better? Static or Dynamic?

Q3. (20 points)

Suppose there is enough public support for climate change legislation that a new law is passed, stipulating that firms will be taxed for each unit of greenhouse gas (GHG) emitted. GHG is a byproduct of production. But firms can also adopt some pollution abatement equipment that allows them to eliminate the emission of GHG. As with most technologies, the cost of adoption decreases over time. As such, let:

- i. Product demand: $P = a - Q$
- ii. Total cost of production (TC) = cQ
- iii. Per unit tax = τ
- iv. Cost of abatement equipment = $C\lambda^t$, where C is a constant and $0 < \lambda < 1$, so that the cost decreases over time

The goal of this question is to find the optimal time for firms to adopt this pollution abatement equipment. Suppose that the firm of interest is a monopoly and that it will not go out of business.

- a. [4 points] What is the total discounted profit of the firm before it adopts the equipment at time T ? (ie, profit from time 0 to time $T-1$).
- b. [2 points] What is the total discounted profit of the firm after it adopts the equipment at time T , which can be used immediately at time T ?
- c. [2 points] Write the expression for the present value of the firm, taking into account its discounted profits and cost of adoption.
- d. [4 points] Solve for the optimal time T of adoption. [Hint: The derivative of 2^x with respect to x is $2^x \ln 2$]

Instead of adoption, suppose the firm also has the option of exiting the industry at some point T_x and selling everything it has for a value of K , which depreciates over time at a rate of λ^t , so the functional form is $K\lambda^t$. Of course, the firm can continue to do business before exiting.

- e. [6 points] Write the present value of the firm for this case. Solve for the optimal time to exit.
- f. [2 points] State the key reason why the firm should (or should not) exit.