

Econ 001: Final Exam (Dr. Stein) Answer Key  
May 4th, 2012

**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.
- Calculators are not allowed on this exam.

**The Exam has 3 parts. You will need 3 blue books. One for each part.**

**Part I:**

**Multiple Choice Questions (3 points each/42 points total).**

**Please write your answers in blue book 1.**

1. Three months prior to Madonna's spectacular Superbowl halftime performance, she contemplated singing either "Material Girl" or "Just like a Prayer." If Madonna sings "Material Girl," she would need to pay \$8,000 for a bejeweled bodysuit. For "Like a prayer" the costume would cost only \$3,000. Additionally, Madonna gets \$15,000 of benefit from singing "Material Girl" and \$5,000 in satisfaction from "Like a Prayer". Prior to purchasing either costume, what is the opportunity cost of singing "Material Girl"?

- a. 23,000
  - b. 18,000
  - c. 13,000
  - d. 10,000
  - e. 3,000
2. Which of the following situations best illustrates the concept of consumer surplus?
- a. a manufacturer reduces the price of an item from \$ 2.50 to \$ 2.30 in the hope of being able to sell more units.
  - b. a consumer who was not willing to buy a car at \$ 100,995, but was prepared to buy it at \$ 99,995.
  - c. a British tourist who was willing to pay \$ 5.00 for a burger, but was only charged \$ 4.00 instead.
  - d. a market reaches a condition whereby the demand for a product is greater than the producers' ability to supply it.

3. For every one percent increase in the price of beer, consumers decrease their consumption by one third of a percent. The elasticity of demand for beer is best described as which of the following?

- a. inelastic
- b. unit-elastic
- c. elastic
- d. unit-inelastic

4. Sheila consumes just two goods: milk and biscuits. Biscuits are inferior goods. Please consider the case that the price of milk recently decreased and state which of the following statements must be true.

- I. Sheila will buy more milk.
- II. Sheila will buy less biscuits.

- a. Only I
- b. Only II
- c. Both I and II
- d. Neither

5. If a (binding) price ceiling is imposed, for a monopoly market, the quantity consumed will \_\_\_; for a perfectly competitive market, the quantity consumed will \_\_\_.

- a. increase; decrease
- b. increase; increase
- c. decrease; decrease
- d. decrease; increase

6. If leisure is a normal good, then when wages increase, the substitution effect tells us that workers will work \_\_, while income effect says that workers will work \_\_.

- a. more; less
- b. more; more
- c. less; less
- d. less; more

7. Consider the laptop industry with the aggregate demand given by  $Q=8000-200P$ . On the supply side there are 1000 perfectly competitive firms operating in the industry with the following costs of production:

$$AVC = 10 + 5q$$

$$FC = 45$$

$$MC = 10 + 10q$$

Suppose that the market is currently in equilibrium. What is the market equilibrium price?

- a. 5
- b. 25
- c. 30
- d. 35
- e. 40
- f. 50

8. Using the information from the previous question, what is the long run equilibrium price?

- a. 5
- b. 25
- c. 30
- d. 35
- e. 40
- f. 50

9. We know that a firm with  $MC=2$  and  $MR=-2Q+10$  is producing at  $Q=5$ . Which of the following must be true?

- I. The firm is profit maximizing.
  - II. The firm is maximizing its revenue.
- a. Only I
  - b. Only II
  - c. Both I & II
  - d. Neither I or II

10. Two team members on a crew team, Kate & Pippa, need to decide how much effort to put into a race. Each can choose either effort (E) or shirk (S). The payoff matrix is specified as follows:

		Kate	
		E	S
Pippa	E	Kate: 8 Pippa: 8	Kate: 10 Pippa: 3
	S	Kate: 3 Pippa: 10	Kate: 4 Pippa: 4

The girls will win the race as long as at least one of them puts in effort. Suppose that Pippa then says to Kate, "if we win, I'll give you half of my payoff from the outcome." In this case,

- I. Without the bonus there is no Nash Equilibrium that yields a win.
- II. With the bonus there is a Nash Equilibrium that yields a win.
- III. With the bonus both girls exert effort.

Which statement(s) is(are) correct?

- a. I only.
- b. II only.
- c. III only.
- d. Both I and II
- e. Both II and III
- f. Both I and III
- g. All three statements are correct.
- h. None of the statements are correct.

11. The market for e-books is growing faster and faster. Without any government intervention, can it achieve efficiency?

- a. Yes, because the e-book is an excludable good
- b. Yes, because there is a free rider problem
- c. No, because the e-book is a non-rival good
- d. Yes, because it's a private good

12. Cheesecake Factory wants to hire workers to produce cheesecakes. Below is the productivity of each worker.

	1 <sup>st</sup> worker	2 <sup>nd</sup> worker	3 <sup>rd</sup> worker	4 <sup>th</sup> worker
Productivity	10 cakes/day	7 cakes/day	5 cakes/day	3 cakes/day



Each cheesecake could be sold at a price of \$10. Cheese, milk, and all of the other materials cost \$3 per cake. Moreover, the daily wage rate is \$30 per worker. Given the information above, how many workers would Cheesecake Factory hire?

- a. 1 worker
- b. 2 workers
- c. 3 workers
- d. 4 workers

13. The mayor of Duckburg decides to collect a new tax to improve recycling. Each resident will pay 5% of her monthly income up to the ceiling of \$5,000 tax per person. What will be the consequences for the wealth distribution in Duckburg?

- a. The tax is proportional and the Gini coefficient will stay the same.
- b. The Gini coefficient increases since the tax is regressive
- c. The Lorenz Curve moves farther away from the 45 degree line since the tax is progressive.
- d. The Gini coefficient decreases since the tax is regressive.

14. The state of Washington is considering increasing its minimum wage. Suppose we believe that this will not cause unemployment. This suggests that:

- a. Demand for labor is perfectly inelastic.
- b. The Supply of labor is perfectly inelastic
- c. The equilibrium wage is higher than the suggested minimum wage.
- d. All of the above are possible explanations.

Answers:

1. d

2. c

3. a

4. c

5. a

6. a

7. c

8. e

9. b

10.d

11.c

12.c

13.b

14.c

**This is still Part I: Please answer in blue book 1.**

**Q1. (24 points) Please show your work!**

**Comment:** explanation in this question should be limited to one sentence each. There is truly no need for more.

Peter owns the only bike shop in Bikersville. Naturally, there are many cycling enthusiasts in Bikersville who would like to work at a bike shop. Peter is thus their only employer. The labor supply curve of enthusiasts in Bikersville is given by  
 $w = 16 + 4 * L_s$

Peter receives \$4 for each bike he sells and has the following marginal product of labor  
 $MP_L(L) = 10 - L$

The marginal cost at which he hires labor is given by  
 $MCL(L) = 16 + 8 * L$

- a) Why is the marginal cost of labor higher than the wage rate for all L?
- b) How many workers does Peter hire? What wage does he pay them?
- c) Supposing that labor is his only input and that there are no fixed costs, how many bikes does he produce and sell in the situation in b? What are his total revenues? What are his total profits? (assume workers and bikes are hired and sold in discrete units)
- d) Is Peter hiring the efficient number of workers? Why or why not? If not, what is the efficient number of workers? What is the wage at this point?
- e) What are Peter's profits under the situation in d? (again, assuming workers and bikes are discrete) Are they greater than or less than his profits in c?
- f) Now suppose that Peter, being a biker himself, knows the cycling community very well. In fact, he knows exactly the wage that any worker would be willing to work for and pays them accordingly i.e. different workers can receive different wages. How many workers would he hire under this scenario? Is this efficient? What are his profits in this case?

**Answers Key:**

**a. Because in order to hire the additional worker the wages have to be increased for all current workers. There is no wage discrimination.**

**Points: 2**

**b. Peter sets  $MCL=MRP$ , Where  $MRP=MP_L(L) * P=(10-L)*4=40-4L$ .**

**So  $16 + 8*L=40-4L$  or  $L^M=2$**

**$w = 16 + 4*L_s = 16+8=24$**

**Points:4 ; 1 for each line.**

**c. If  $L=2$  then we can find  $TP=MP(1)+MP(2)=(10-1)+(10-2)=9+8=17$**

**So his revenues are  $P*Q=17*4=68$**

**His labor costs (the only cost) is  $24*2=48$**

**Profit=Rev-Cost=20**

**Points: 5; Finding L: 2; Revenue, cost & profits: 1 each**

**d. For efficiency we need  $S_L=MRP_L$  or**

**$w = 16 + 4*L_s = 40-4L$  or  $L^{eff}=3$  and  $W=28$**

**as currently  $MRP_L=MC_L>S_L$  or  $S_L<MRP_L$ , the market outcome inefficient.**

**Points: 4; 2 for efficiency criteria, 1 for L, 1 for w**

**e. Now  $TP=MP(1)+MP(2)+MP(3)=(10-1)+(10-2)+(10-3)=9+8+7=24$**

**So his revenues are  $P*Q=24*4=96$**

**His labor costs (the only cost) is  $28*3=\$84$**

**Profit=Rev-Cost=\$12**

**Points: 3; 2 for calculating TP; 1 for profit (no partial credit).**

**f. In this case Peter hires the competitive number of worker (3) and pays them each their reservation wage. As this is the same number of workers as in the competitive outcome it is efficient.**

**His revenues are as in part e.**

**His costs are  $w(L=1)+w(L=2)+w(L=3)=20+24+28=72$**

**His profits:  $96-72=\$24$**

**Points: 6; L=3: 1; outcome it is efficient: 1; Revenues:1**

**His costs are  $w(L=1)+w(L=2)+w(L=3)=20+24+28=72$  :2 points**

**His profits:  $96-72=\$24$ : 1**



**Part II: Please answer in blue book 2.**

**Q2. (24 points)**

You will need to draw TWO graphs to answer this question.

Please DO NOT be lazy. Draw new graphs when asked. Label everything clearly. Use color pens when deemed helpful. **Full credit depends on the ability of the TA to follow your work!**

Let us again revisit the impact of Pell Grants in the market for university admission. Credit is given for correct graphical analysis, though the numbers here will help you draw the graphs correctly.

Consider The U, a perfect-price-discriminating monopoly facing the following curves:

$$MC = 10$$
$$Q_D = 10 - P/2 \text{ or } P = 20 - 2Q_D$$

- a) Draw a graph of the marginal cost, demand, and marginal revenue curves facing The U. Clearly label all axes, curves, and intercepts.
- b) Show the number of students admitted and the total tuition paid on your graph. (Remember, in this model, admission is based solely upon willingness to pay, not merit.)

It has come to the government's attention that education yields a positive externality equal to  $8 - Q$  for each student admitted to The U.

- c) Draw a new graph. This time your graph should include the MC and MR facing The U, as well as the private marginal benefit and social marginal benefit. Clearly label all axes, curves, and intercepts.
- d) Show the efficient number of students admitted to The U. Does The U admit this number of students? If not, indicate any dead weight loss on your graph.

In order to achieve efficiency, the government offers a Pell Grant subsidy of  $X$  per student admitted to The U.

- e) Show graphically (or find numerically) the value for  $X$  that would achieve efficiency.
- f) Comment on the effects of Pell Grants here using the two typical criteria.

**Answer Key:**

**a. MC constant at a value of \$10. Demand downward sloping and MR is the same curve as demand since The U is perfectly price discriminating.**

**Points: 3; MC, D & MR: 1 each.**

**b. Setting  $10 = 20 - 2Q$  gives  $Q^* = 5$  students admitted.**

**Total tuition paid is the trapezoid under demand up to  $Q=5$**

**Tuition =  $(20+10)*5/2=\$75$ .**

**Points: 2; Q at intersection of D & MC: 1; Tuition being trapezoid: 1**

**c.  $PMB = 20 - 2Q$ ,  $EMB = 8 - Q$ ,  $SMB = 28 - 3Q$**

**MC still constant at 10. Demand = MR = PMB.**

**Note that SMB starts above the PMB and the distance between the two lines decreases in Q. In this specific case it turns out that for  $Q>8$  the externality is no longer positive. I suppose that if we have too many educated people they may actual do harm. Just think a world full of economists: an awful thought.**

**Points: 6**

**PMB=Demand: 1; SMB above PMB: 2**

**SMB gets closer to PMB as Q increases:2; SMB below PMB for  $Q>8$ : 1**

**d.  $SMB = MC$  means  $28 - 3Q = 10$  which gives  $Q^{**} = 6$ . The U admits fewer students than this number. DWL is the triangle above MC and below SMB between the quantities of 5 and 6. (DWL = \$1.5).**

**Points: 5**

**Efficient where  $SMB=MC$ : 2; Where  $MR=PMB=MC$  inefficient :1; DWL:2 (no partial credit)**

**e. Graphically, X should shift MC down until MC' intersects PMB at a quantity of**

**6. We can solve for this numerically as**

$$10 - X = 20 - 2(6)$$

$$10 - X = 8$$

**X = \$2 per student subsidy.**

**Points: 4**

**f. Efficiency: because of the externality, Pell Grants move us to the efficient output.**

**Equity: For example: The way the Pell Grants are implemented here they go to every student, which some may consider unequal since students with a high willingness to pay would have gotten the education anyway.**

**Points: 2 each.**

**Part III: Short Answer Questions 3. Please answer in blue book 3.**  
**Q3. (10 points)**

The three citizens of the Greenleaf are trying to choose the number of trees to plant in their local park. They have the following total benefit from trees:

Number of trees	Lyles	Gracie	Jackson
1	10	20	12
2	18	30	20
3	24	35	26
4	25	36	30

The cost of planting each tree is \$20.

- a. How many trees should they plant in their park? What is the total cost of tree planting? What is the total surplus generated at this level of planting?
  
- b. Jody, a consultant hired to assist Greenleaf, reminds the three that they will have to pay for the trees today, but the benefit will only accrue in the future, once the trees have fully grown. How would her analysis affect your answer? No specific numbers are needed, just an explanation.
  
- c. Eric, a second consultant, suggests that with current interest rates it does not matter when the money is paid compared to when the trees will finally be of benefit. What is he implying?

**Answer Key:**

**a. The efficient number of trees is where  $SMB \geq MC$**

**To calculate the SMB we will calculate MB for each citizen and sum them up:**

Number of trees	MB(Lyles)	MB(Gracie)	MB(Jackson)	SMB
1	10	20	12	42
2	8	10	8	26
3	6	5	6	17
4	1	1	4	6

**We can see that the first and second tree both have Social Marginal Benefit greater than their cost of \$20 so they should be planted. For the 3<sup>rd</sup> tree the SMB is less than 20 and it should not be planted.**

**The cost of planting 2 trees is  $2 * 20 = 40$ .**

**The total surplus generated is total benefit - total cost =  $(18 + 30 + 20) - 40 = 68 - 40 = 28$**

**Points: 65**

**Finding Q: 3**

**Cost: 1**

**Surplus: 2**

**Note: a student who calculated using total benefit instead of marginal benefit loses 2 points.**

**b. Her analysis suggests that social benefit from each tree is actually lower than what's given in the table since the present value of each marginal benefit would be discounted by the interest rate, this makes it more likely that we would want to choose a smaller number of trees.**

**Points: 3**

**For understanding that the question is about discounting: 1**

**PV < FV: 2**

**c. Eric is saying that  $PV = FV$  which implies that the interest rate is currently 0 (which it is).**

**Points: 2**

**For understanding that the question is about lower interest rates: 1**

**$r = \text{zero}$ : 1**

**You are done! Have a great summer!**