

**University of Athens**  
**Department of Economics**  
**Master's program in Applied Economics**

Academic year 2023-2024

*Course: Economic Policy*

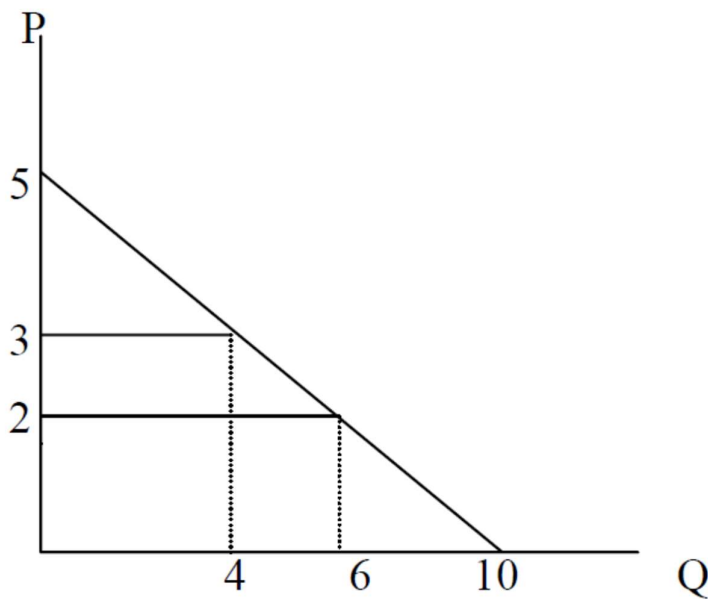
*Assignment no. 1:*

*Answer all questions. Deadline 7 May 2024*

**Question 1.**

Annas' demand curve for apples is:  $Q = 10 - 2P$ , where Q is the pounds of apples per week, and P is the price per kilo of apples.

- (1) If the price of apples is €3 per kilo, what is Anna's consumer surplus?
- (2) If the price goes down to €2 per kilo, what is the change in consumer surplus?



**Question 2.**

Which of the following is true

Consumer surplus is:

- a) A measure of consumer welfare.
- b) The area under the ordinary demand curve.
- c) The area under the supply and demand curves.
- d) The best measure of consumer welfare.

**Question 3.**

Which of the following statements is true?

- The compensating variation measures the income transfer necessary to maintain the consumer at the initial level of utility when facing the new prices.
- The compensating variation measures the income transfer necessary to maintain the consumer at the final level of utility when facing the old prices.
- The equivalent variation measures the income transfer necessary to maintain the consumer at the initial level of utility when facing the new prices.
- The equivalent variation measures the income transfer necessary to maintain the consumer at the final level of utility when facing the old prices.

**Question 4.**

Since the free market (competitive) equilibrium maximizes social efficiency, why would the government ever intervene in an economy?

**Question 5**

Consider a firm with no fixed costs, but continuously increasing marginal costs ( $MC$ ). The demand curve is  $D=6-Q$ , and the supply  $S=Q$ . The variable  $Q$  denotes quantity, while  $P$  denotes price.

- Assume initially that the firm uses marginal cost pricing (as in competitive market equilibrium). Find  $Q$  and  $P$  in this case. How big is the firm's profit? How big is the producer surplus? How big is the consumer surplus? (Assume that the compensated demand curve is identical to the ordinary demand. Find social welfare as the sum of the consumer surplus and the producer surplus.)
- Now assume that the firm behaves like a monopolist. What is the monopoly output and price? What is the firm's profit? How big is the producer surplus? How big is the consumer surplus? Find social welfare in monopoly.
- Compare your findings in a) and b) and comment briefly.
- Calculate the deadweight loss resulting from monopoly in this case. Compare the deadweight loss under monopoly and perfect competition.

**Question 6**

- Consider a mini-society consisting of five individuals. They earn respectively 5, 20, 25, 10, and 40. Draw the Lorenz curve for this mini-society.
- Assume that the government implements a programme yielding the following distribution: 20, 5, 15, 40, and 20. How did the programme impact the distribution as measured by the Lorenz curve?
- Assume that instead of the programme in c), the government implements a redistribution programme resulting in the following incomes: 5, 30, 30, 5, and 30. How did this programme change the distribution in b) as measured by the Lorenz curve?

**Question 7**

Consider a Lorenz curve given by the equation  $s_M = (s_h)^2$  where  $s_M \in [0,1]$  denotes the share of income and  $s_h \in [0,1]$  denotes the share of households.

- Explain how the Gini coefficient is calculated and how it should be interpreted.
- Calculate the Gini coefficient for the Lorenz curve in b).

**Question 8**

Consider two households, A and B, with potentially different demographic compositions. Both have (monetary) income and spend it on two goods,  $x_1$  and  $x_2$ . Good 1 is food, while good 2 is housing. The price of good 1 is  $p_1$  and the price of good 2 is  $p_2$ . Household A has income  $M^A$  and the utility function  $U^A = (x_1^A)(x_2^A)^{M^A}$ , while household B has income  $M^B$  and the utility function  $U^B = (x_1^B)(x_2^B)^{(M^B)^2}$ . (Notice the income variables in the exponents.)

- Find household A's and household B's demand for food. (The households take incomes and prices as given.)
- At which income level does household A spend 50% of its income on food? At which income level does household B spend 20% of its income on food?
- Find the Engel equivalence scale.

**Question 9.**

Sketch the indifference curves of the Bergson-Samuelson social welfare function  $W = U^1 + U^2$ . What do these indifference curves imply about the degree of concern for equity of the social planner? Repeat for the welfare function  $W = \min\{U^1, U^2\}$ .

**Question 10.**

There are  $H$  consumers who each have utility function  $U^h = \log(M^h)$ . If the social welfare function is given  $W = \sum U^h$ , show that a fixed stock of income will be allocated equitably. Explain why this is so.

**Question 11.**

Consider a community with ten persons.

- Plot the Lorenz curve for the income distribution (2, 4, 6, 8, 10, 12, 14, 16, 18, 20).
- Consider an income redistribution that takes two units of income from each of the four richest consumers and gives two units to each of the four poorest. Plot the Lorenz curve again to demonstrate that inequality has decreased.
- Show that the Lorenz curve for the income distribution (2, 3, 5, 9, 11, 12, 15, 17, 19, 20), crosses the Lorenz curve for the distribution in part a.
- Show that the two social welfare functions  $W = \sum M^h$  and  $W = \sum \log(M^h)$  rank the income distributions in parts a and c differently.

**Question 12.**

For a utilitarian social welfare function construct  $M_{EDE}$  for the distributions used in the previous exercise if the utility of income is logarithmic. Find the Atkinson inequality measure. Repeat the exercise for the Rawlsian social welfare function. Compare and discuss.

**Question 13**

Assume that fireworks are a public good. Aris and Betty have the following individual demand curves for fireworks.  $P_A = 200 - Q_A$  and  $P_B = 100 - Q_B$ , where  $Q_A$  and  $Q_B$  represent the amount of fireworks consumed by Aris and Betty, respectively. The marginal cost of producing another unit of fireworks is given by:  $MC = 25 + (1/2)Q$

- Calculate the socially optimal quantity of fireworks.
- If Betty did not contribute at all for the fireworks, and Aris provided her privately optimal quantity, what would be the welfare loss to society?

**Question 14.**

Is the following statement true?

"If there are negative externalities in production or consumption, competitive equilibrium is unlikely to be Pareto efficient but positive externalities enhance the efficiency of the market."

**Question 15.**

Suppose that demand for a product is  $Q = 1,200 - 4P$  and supply is  $Q = -200 + 2P$ . Furthermore, suppose that the marginal external damage of this product is €8 per unit. How many more units of this product will the free market produce than is socially optimal? Calculate the deadweight loss associated with the externality.

**Question 16.**

We add the demands of private goods horizontally but add the demands of public goods vertically when determining the associated marginal benefit to society. Why do we do this and why are the procedures different for public and private goods?

**Question 17.**

It is known that some fraction  $d$  of all new cars are defective. Defective cars cannot be identified as such except by those who own them. Each consumer is risk neutral and values a non-defective car at €16,000. New cars sell for €14,000 each, and used ones for €2,000. If cars do not depreciate physically with use, what is the proportion  $d$  of defective new cars?

**Question 18**

There are two types of drivers on the road today. Speed Racers have a 5% chance of causing an accident per year, while Low Riders have a 1% chance of causing an accident per year. There are the same number of Speed Racers as there are Low Riders. The cost of an accident is €12,000.

- a. Suppose an insurance company knows with certainty each driver's type. What premium would the insurance company charge each type of driver?
- b. Now suppose that there is asymmetric information so that the insurance company does not know with certainty each driver's type. Would insurance be sold if:
- i. Drivers self-reported their types to the insurance company?
  - ii. No information at all is known about individual driver's types?
- If you are uncertain whether insurance would be sold, explain why.