



Stockholm
University

Department of Economics

Course name: Intermediate microeconomics
Course code: EC2101
Type of exam: Re-take
Examiner: Lars Vahtrik
Number of credits: 7,5 credits
Date of exam: Sunday 10 November 2019
Examination time: 5 hours (09:00-14:00)

Write your identification number on each answer sheet (the number stated in the upper right hand corner on your exam cover).

Explain notions/concepts and symbols. If you think that a question is vaguely formulated, specify the conditions used for solving it. Only legible exams will be marked. **No aids are allowed.**

The exam consists of 5 questions. Questions 1-3 are worth 25 points each. Question 4 is worth 15 points and question 5 is worth 10 points. The maximum score on the exam is 100 points in total. For the grade E 45 points are required, for D 50 points, C 60 points, B 75 points and A 90 points.

If you have the course credit you do not answer question 5.

Your results will be made available on your Ladok account (www.student.ladok.se) within 15 working days from the date of the examination.

Good luck!

Question 1

Kim has the utility function $U(x_1, x_2) = x_1^{\frac{4}{5}} x_2^{\frac{1}{5}}$.

- a) Set up the Lagrangian and derive an expression for the marginal rate of substitution and derive the Marshallian demand for both goods. **(10p)**
- b) Assume that the initial price of x_1 is given by $p_1^0 = 4$ and that the initial income is given by $M^0 = 150$. Now assume that the price of x_1 decreases to $p_1^1 = 3$. Calculate the income effect and the substitution effect based on the Slutsky equation and explain the logic behind your calculation. Discuss if x_1 is a normal good or an inferior good to Kim. **(8p)**
- c) Now assume that Kim's income is denominated by an endowment of good 1 and good 2 such that $\omega_1 = 37,5$ and that $\omega_2 = 0$ (so that initial income remains $M^0 = 150$). Calculate the endowment income effect and recalculate the total effect of the price decrease. Discuss if your result is a coincidence or a more general result. **(7p)**

Question 2

- a) A steel mill is producing steel, s , while creating a negative externality, x , affecting a downstream fishery negatively. The steel is sold in a competitive market at a price of $p_s = 800$. The steel mill's cost function is given by $c_s = 40s^2 + 5x^2 - 50sx$ so that the externality reduces cost up to a point. The fishery produces fish, f , sold in a competitive market at price $p_f = 400$. The fishery has the cost function $c_f = 10f^2 + 20fx$. Set up the profit function for the steel mill and the fishery and derive the first order conditions. Solve for s , f and x and calculate the profits for the fishery and the steel mill. Show that the outcome is inefficient. **(10p)**
- b) Now assume that the steel mill is given the right to use the water as they wish. The fishery can then buy pollution permits (or reduction of the externality) from the steel mill at a price q . By selling a pollution permit the steel mill is forced to reduce the externality. Set up the maximization problems and derive the first order conditions. Solve for s , f , x and q and show that the new solution will be efficient. How many permits will be sold and what will happen to the emission level? Recalculate profits and explain why the profits give further evidence of increased efficiency. **(15p)**

Question 3

- a) The firm ACME has the production function $f(x_1, x_2) = x_1^{\frac{2}{5}} x_2^{\frac{2}{5}}$. Calculate an expression for the marginal product of labour, L, and establish if it is increasing, constant or decreasing. Verify if ACME's production technology exhibits increasing, constant or diminishing returns to scale. **(8p)**
- b) Set up ACME's long run profit maximization problem and derive the factor demands for optimal choice of y. **(9p)**
- c) Discuss if it is possible to derive ACME's long run supply function in this case. If so, please calculate the long run supply. **(8p)**

Question 4

Consider the following normal form entry deterrence game between an incumbent monopolist and a potential entrant.

		Potential entrant	
		Enter	Stay out
Incumbent	P_H	200,40	400,0
	P_L	100,-10	150,0

The entrant can either stay out or enter the market. If entry occurs the incumbent firm may accommodate the newcomer and split monopoly profits (p_H) or start a price war (p_L).

- a) Write down the sequential (extensive form) game and find the subgame perfect equilibrium. Explain the outcome. **(7p)**
- b) Now assume that the incumbent firm has the option of making a strategic investment before the entrant chooses to enter or not. The only effect of the investment is to increase the incumbents cost when producing a low quantity (p_H), thereby reducing the incumbents profits by 150. Write down the extended sequential game and find the subgame perfect equilibrium. Explain your results. **(8p)**

Question 5

Find all Nash equilibria, including the mixed strategy equilibrium, in the following normal form game:

		Player 2	
		LEFT	RIGHT
Player 1	UP	4,1	0,0
	DOWN	0,0	1,2

Explain your results. **(10p)**