



**Stockholm
University**

Department of Economics

Course name: Intermediate microeconomics
Course code: EC2101
Type of exam: Main
Examiner: Adam Jacobsson
Number of credits: 7,5
Date of exam: 190224
Examination time: 09.00-14.00
Aids: No aids are allowed.

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

Start each new question on a new answer sheet.

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.

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. 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!

When in doubt, follow your nose!



Question 1

Bilbo can consume two goods, good 1 and good 2 where x_1 and x_2 denote the quantity consumed of each good. These goods sell at prices p_1 and p_2 , respectively. Bilbo's preferences are represented by the following utility function: $u(x_1, x_2) = 3x_1x_2$. Bilbo has an income of m .

- Derive Bilbo's Marshallian demand functions for the two goods. (10 points)
- Given your answer in a), are the two goods normal goods? Explain why and show this mathematically. (4 points)
- Calculate Bilbo's price elasticity for good 1. Explain also in words what the measure means. (4 points)
- Would the utility function $u(x_1, x_2) = -2x_1x_2$ still represent Bilbo's preferences? Motivate your answer! (4 points)
- Bilbo's cousin, Frodo, has the utility function $u(x_1, x_2) = 3x_1 + x_2$. In Frodo's part of the world $p_1 = 8$ and $p_2 = 2$. Frodo has an income of m . How much of that income will Frodo spend on good 1? (3 points)

Question 2

An upstream Elf steel mill is producing steel, s , while creating an externality, x , affecting a downstream Hobbit fishing industry negatively. The steel is sold in a competitive market at a per unit price of $p_s = 200$. The steel firm's cost function is $c_s = 10s^2 + 4x^2 - 24x$ so that producing the externality reduces the cost to the steel mill up to a point. The fishing industry produces fish, f , sold in a competitive market at a per unit price of $p_f = 200$. The fishing industry has a cost function $c_f(f, x) = 5f^2 + 8x$.

- Set up the profit maximization problem for the Elf steel mill (which does not consider its impact on the Hobbit fishing industry) and find the profit maximizing levels of s and x . (5 points)
- Given the chosen Elf level of x (the level of x you found in question a)), set up the fishing industry's profit maximization problem and solve for the profit maximizing level of fish, f . (5 points)
- What are the levels of profit for the steel mill and the fishing industry? What is the sum of the two firms' profit levels? (2 points)



The Hobbits get increasingly angry with the Elves and their externalities and demand that the wizard Gandalf, a famous economist, should come and resolve the argument. Gandalf, in his infinite wisdom, assumes command of the situation and decides on the levels of s , f and x with the aim of maximizing the sum of profits from both industries.

- d) What levels of s , x and f will Gandalf pick? (10 points)
- e) Compare the sum of profits of the steel- and fishing industries between question c) and d). Compare also the levels of the externality in the two cases. Explain any differences you find! Any differences in efficiency? (3 points)

Question 3

Consider a market for a homogenous good (Hobbit beer) with the following inverse demand function: $p(y) = 22 - 2y$ where y is total sold quantity of the beer in litres on the market and $p(y)$ is the price it sells for. There is only one firm serving the market, Samwise beer inc. The firm's cost function is $c(y) = 4y$.

- a) What quantity of beer will be sold on the market? What will be the market price? (10 points)

Suddenly, a new beer producing firm, The Prancing Pony, enters the market. It produces the same kind of beer as Samwise beer inc and has an identical cost function. The two firms are now faced with a problem of simultaneously deciding on how much beer to sell on the market (the inverse demand function is still the same). Since none of the two firms has access to any magic they do not know the competitor's choice of quantity when deciding on their own quantity.

- b) Derive both firms' best response functions and draw these in a diagram. (6 points)
- c) What is the new equilibrium quantity of beer sold in the market and what is the equilibrium market price? (6 points)
- d) What are the profit levels of Samwise beer inc before and after the Prancing Pony entered the market? Explain any differences in those levels. (3 points)



Question 4

The Elf ring manufacturer, Elrond Rings, uses capital, K , and labour, L , to produce rings according to the following production function: $f(K, L) = K^{\frac{1}{4}}L^{\frac{1}{4}}$. Let r and w be the prices of capital and labour respectively. P is the price of rings. The markets for rings, capital and labour are all perfectly competitive.

- Does Elrond Rings' production technology exhibit increasing, decreasing or constant returns to scale? Explain your answer using mathematics. (5 points)
- What is the technical rate of substitution between capital and labour for Elrond Rings? (5 points)

In the short run, the level of capital is fixed at $K = \bar{K}$.

- Set up the short run profit maximization problem. Calculate the short run optimal level of labour. (5 points)

Question 5

If you have the course credit, do not answer this question.

Gandalf (from question 2) suddenly becomes very annoyed with the Hobbits and decides that the Elves have the right to produce 3 units of externality. The Hobbits can now pay the Elves to reduce the level of the externality at a price of q per unit of externality. He then lets the two firms decide for themselves.

- Calculate the new profit maximizing levels of s , x and f and also solve for q ! (7 points)
- How does your answer differ (or not) from your answers in question 2? Explain! (3 points)