Stockholm University

Department of Economics

Course name:	**Intermediate microeconomics**
Course code:	**EC2101**
Type of exam:	**Retake**
Examiner:	**Lars Vahtrik**
Number of credits:	**7,5 credits**
Date of exam:	**Sunday 16 December 2018**
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).

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. **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

a) Kim has the utility function $U(c_1,c_2)=c_1^{\frac{1}{2}}c_2^{\frac{1}{2}}$ where c_1 represents consumption in time period 1 and c_2 consumption in time period 2. Calculate Kim's MRS and state the condition for optimal intertemporal consumption. Assuming that income is constant over time, $m_1=m_2$, and that the interest rate is $r=\frac{1}{10}$, draw a budget line and write a mathematical expression for the intercepts with the c_1 axis and the c_2 axis respectively. Give an economic interpretation of the mathematical expressions. Show Kim's optimal choice graphically. Will Kim be a net borrower or a net lender in ths case? Explain your findings. **(13p)**

b) Show , in principle , what will happen if the interest rate increases to $r=\frac{2}{10}$. Is it possible that Kim changes behaviour from being a net lender/borrower to become a net borrower/lender in this case? Explain why! What can you say about the direction of change in c_1 and c_2 respectively given what you know about utility functions of this type. No calculations needed but please give a thorough explanation of your conclusions. **(12p)**

Question 2

a) A steel mill is producing steel, s, while creating an externality, x, affecting a downstream fishing industry negatively. The steel is sold in a competitive market at price of $p_s=400$. The firm's cost function is $c_s=20s^2+2x^2-24x$ so that producing the exernality reduces the cost to the steel mill up to a point. The fishing industry produces fish, f, sold in a competitive market at price $p_f=200$. The fishing industry has a cost function $c_f=10f^2+12x$. Set up the profit function for the steel mill and for the fishing industry and derive the first order conditions. Solve for s, f and x and calculate the profits π^s and π^f. Show that the outcome is inefficient. **(10p)**

b) Now assume that the fishing industry is given the right to clean water. The fishing industry may then sell pollution permits, x, to the steal mill at a price q. With no permit the steel mill cannot produce 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 the profits and explain why the profits give further evidence of increased efficiency. **(15p)**

Question 3

a) Robin has the utility function $U(w)=w^{\frac{1}{2}}$ and has the prospect of investing in an asset that, with probability π, will have a good outcome $w_g=(w-x)+x(1+r_g)$, where w is Robin's initial wealth, x the amount invested and r_g the return on he investment. With probability $(1\text{-}\pi)$ the investment will have a bad outcome $w_b=(w-x)+x(1+r_b)$ where $r_b<r_g$. Simplify the expressions and use the contingent consumption model to derive the first order condition for optimal investment. Also calculate the second order condition to establish Robin's risk preferences. Will Robin invest in the risky asset at all? (Hint: Evaluate the first order condition at x=0 and give the expression an economic interpretation). **(13p)**

b) How will Robin's behaviour change if we introduce a tax on returns so that the return on the investment will be $(1-t)r_g$ and $(1-t)r_b$ respectively? Set up the first order condition and compare it to your result in **a)** to derive an expression for the new investment level with tax, $\hat{x}$, as a function of the investment level without a tax, x^* (Hint: Which level $\hat{x}$ will give you the original first order condition that you derived in **a)**?). Calculate Robin's optimal investment level with a tax $t=\frac{2}{10}$ on returns given that the optimal investment level without a tax equals 1000. Explain the economic intuition behind your result. **(12p)**

Question 4

a) The firm ACME has the production function $f(K,L)=K^{\frac{2}{3}}L^{\frac{2}{3}}$. 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 diminishing, constant or increasing returns to scale. **(6p)**

b) Set up ACME's long run profit maximization problem and derive the factor demands for optimal choice of y. **(9 p)**

Question 5 (Credit question)

Try to derive a long run supply function for ACME using your calculations in **4b)**. Did your effort result in a viable supply function? Explain why. **(10p)**