

Intermediate Microeconomics

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Sample Final Exam

To be discussed in the week of 7th December 2009

Question 1 - 20 Points Acme make magnets using labor and capital. Their production function is given by $m = \min(2l, 3k)$.

1. (5pts) On a graph with k on one axis and l on the other, sketch the iso-output line for $m = 6$. For a wage rate w and a rental rate r what is the cost minimizing way of producing 6 units of m ? What is cost of producing 6 units (as a function of w and r)? More generally, what is Acme's cost function?
2. (3pts) Calculate Acme's marginal and average cost curves. Will Acme ever choose to produce at $m = 0$? If so, at what prices? Will they ever choose to produce at $m = \infty$ (i.e always want to produce more, however much they are currently producing)? If so at what prices?
3. (6pts) Acme's technology is disrupted (possibly by roadrunner). Their new production function is given by $m = (\min(2l, 3k))^\beta$ for $0 < \beta < 1$. Repeat parts 1 and 2 of the question.
4. (6pts) Acme's technology goes completely haywire, and their production function is now given by $m = (\max(2l, 3k))^\beta$. Repeat parts one and two of the question

Question 2 - 10 Points Mother Goose is trying to allocate bundles of corn and water between her two offspring, Grey and Wild. She is going to use the Pareto criterion to rank them - i.e she will prefer an allocation A to an allocation B if and only if Grey and Wild both prefer A to B. If Grey and Wild's preferences are complete and transitive, then is Mother Goose's

ranking complete and transitive? Can it be represented by a utility function - i.e. is there a utility function such that Mother Goose ranks A over B if and only if $u(A) > u(B)$ and A is indifferent to B if and only if $u(A) = u(B)$.

Question 3 - 15 Points Geoff is going to live for two years. All he consumes is tofu. If he consumes t_1 units of tofu this year and t_2 units of tofu next year, his utility is

$$(t_1)^{\frac{1}{2}} + \beta(t_2)^{\frac{1}{2}}$$

Geoff currently gets \$10 income in each year. Whatever he does not spend this on tofu this year he puts in the bank and earns interest. If he saves an amount M he will get $(1+r)M$ (plus his \$10 income) to spend on tofu next year. Say that the price of tofu is \$1 per unit

1. (4 pts) If Geoff buys t_1 units of Tofu this year, how much tofu can he buy next year?
2. (7 pts) Substitute your answer to part 1 into Geoff's utility function. Find the optimal level of consumption in the first year (t_1) as a function of β and r
3. (4 pts) Show that, if $(1+r) = \beta$, then Geoff will consume 10 units of tofu in each period

Question 4 - 15 Points Nisha has a utility function for money given by $u(x) = x^{\frac{2}{3}}$

1. (3 pts) What is Nisha's utility from \$1000? What about from a gamble that gives her \$500 with probability 0.5 and \$1500 with probability 0.5. Is Nisha risk averse?
2. (3 pts) Nisha has savings equal to an amount w . She can invest her money either in a bond, which gives her a return of $(1+r)$ for sure, or a stock, which has a 50% chance of giving her a return S_1 and a 50% chance of giving a return S_2 (in other words, if you invest \$1 in the stock, then with 50% chance you get S_1 , and with a 50% chance you get S_2). Say that Nisha invests a proportion α of her wealth in the bond and $(1-\alpha)$ in the stock. What is Nisha's income if the stock pays S_1 ? What is her income if the stock pays S_2 ?
3. (3 pts) What is Nisha's expected utility if she invests α in the bond?
4. (3 pts) If Nisha wants to maximize her expected utility, she should take the derivative of the expression you just figured out with respect to α and set it equal to zero. Calculate these first order conditions.

- (3 pts) Let c_1 be the total income Nisha gets from the stock and bond if the stock pays S_1 , and c_2 be her total income if the stock pays S_2 . Show that, if the expected return of the stock is the same as the bond (i.e. $(1 + r) = 0.5S_1 + 0.5S_2$) then the expression in (4) is satisfied if $c_1 = c_2$. Therefore, if this is the case, how much should Nisha invest in the bond.

Question 5 - 20 points Demand for Kristal is given by $D(p) = 42 - 2p$. The supply function is given by $S(p) = 5p$.

- (5 pts) What is the equilibrium price, output, consumer and producer surplus in the market for Kristal.
- (4 pts) The government decides that Kristal is too expensive, and pass a law so that the maximum price of Kristal is \$4. How much Kristal will producers produce? What is their producer surplus?
- (6 pts) Say that producers produce at the level you calculated in (2), but consumers can buy at \$4, what is their consumer surplus (NOTE: the consumer will not be on their demand curve at this point, as if the price is \$4, they would like to consume more than this amount)
- (5 pts) Say that government changes the law to force producers to produce the same amount as they did in (1), but only charge \$4. Assuming that the area under the supply curve is total cost, will the firms make positive or negative profits? What will consumer surplus be?

Question 6 - 20 points Big Robbie Crusoe is still on the island, and is still pretending to be a person (RC) and a firm (RCI). RC the person buys haddock (h) and sells labor (l), and has preferences over haddocks and leisure given by $u(h, 24 - l) = h^{\frac{1}{4}}(24 - l)^{\frac{3}{4}}$. RC the company buys labor from RC and sells haddock. It has a production function $h = l$

- (5 pts) Sketch the production function of RCI and the indifference curves of RC on the same graph. Imagine that you are the social planner, and are going to pick a feasible combination of haddock and labor to maximize the utility of RC. Find the optimal bundle
- (5 pts) Say that the wage rate is fixed at 1, and the price of haddocks is given by p . How much will RCI want to produce if the price of haddock, p , is less than 1? How

much will they want to produce if it is more than 1? If the price is exactly 1, do their profits depend on how much they produce? Sketch RCI's supply curve.

3. (5 pts) RC gets money from selling his labor, and is also the sole owner of RCI, but assume for the moment that profits of RCI are equal to zero.. Write down RC's budget constraint. Calculate his supply of labor and demand for haddock as a function of p
4. (5 pts) If the price of haddock is equal to 1, how much haddock will RC demand? How much labor will they want to sell? At this price, would RCI be happy producing at this level. Is this price an equilibrium? Is it the solution to the social planners problem?