

Intermediate Microeconomics - Spring 2016

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Final

Monday 9th May

PLEASE ANSWER QUESTION 1 AND 2 IN ONE BOOK, AND QUESTIONS 3 AND 4 IN A DIFFERENT BOOK

PUT YOUR NAME AND UNI ON ALL EXAM BOOKS

GOOD LUCK!

Question 1 (40pts) DB Industries produces stardust (s) using ashes (x_a) and pressure (x_p). Their production function is

$$s = (x_a)^\alpha (x_p)^{\frac{1}{3}}$$

1. In the short run, the amount of pressure is fixed at 1. Assume that DB industries is a price taker, that the price of ashes (p_a) is 2, and the price of pressure (p_p) is 2.
 - (a) **2pts** What is the cost function for DB industries, assuming that $\alpha = 1/2$?
 - (b) **4pts** If the price of stardust (p_s) is 4, what is DB Industries profit maximizing output (assuming $x_p = 1$, $p_p = 2$, $p_a = 2$ and $\alpha = 1/2$)? How much profit do they make?
 - (c) **3pts** What is the supply curve for DB industries (assuming $x_p = 1$, $p_p = 2$, $p_a = 2$ and $\alpha = 1/2$)? Is there a price below which they would prefer to produce zero?
 - (d) **4pts** Imagine the firm suffers from an increase in α . How would their supply curve change? Explain what would happen to the supply curve as α increases from $\frac{1}{2}$ to $\frac{3}{2}$.

2. Assume again that $\alpha = \frac{1}{2}$, $p_a = 2$, $x_p = 1$ and $p_p = 2$. DB industries suddenly realizes that it can act as a monopoly, facing a demand curve $p_s = 6 - 2s$.
- (a) **5pts** What is their profit maximizing output? How much profit would they make?
- (b) **5pts** DB gets sneaky, and realizes that they can increase profits by charging a two part tariff. How would they design their two part tariff (assuming that the consumer's willingness to pay to enter the market is equal to their consumer surplus)? How much profit would they make?
3. In the long run, DB industries can vary both x_a and x_p . Assume $p_p = 2$, $p_a = 2$ and $\alpha = 1/2$
- (a) **7pts** Calculate the cost function for DB industries. Are long run costs higher or lower than short run costs?
- (b) **4pts** Assume once again that DB industries is a price taker, and that $p_s = 4$. What is their profit maximizing output?
4. **6pts** Imagine that, in the short run, DB industries again has $x_p = 1$ and $p_p = 2$, $p_a = 2$ and $\alpha = 1/2$, and that they are a price taker with $p_s = 4$. Suppose they could pay an amount F to be allowed to adjust the amount of pressure they use. What is the maximum F they would be prepared to pay to be allowed to make the change?

Question 2 (25 pts) Phife has income I to spend on ham (x_h) and eggs (x_e).

1. Sketch the indifference curves and calculate his demand functions (i.e. the demand for ham and eggs as a function of income I , the price of ham p_h and the price of eggs p_e) for the following utility functions
- (a) **5pts** $u(x_h, x_e) = \min(x_h, x_e)$
- (b) **5pts** $u(x_h, x_e) = 2 \ln x_h + 3 \ln x_e$
- (c) **5pts** $u(x_h, x_e) = \max(x_h, x_e)$
2. **10 pts** Now Phife is also considering buying bread rolls as well (x_b) his utility function is $u(x_b, x_h, x_e) = \min(x_b, x_h^{\frac{1}{2}} x_e^{\frac{1}{2}})$ (i.e. the minimum of x_b and $x_h^{\frac{1}{2}} x_e^{\frac{1}{2}}$). Again calculate Phife's demand function as a function of I , p_h and p_e and p_b , the price of bread rolls. (Hint: at the optimum what has to be true of x_b relative to $x_h^{\frac{1}{2}} x_e^{\frac{1}{2}}$?)

Question 3 (20pts) Some questions on game theory

1. **6 pts** Consider the following game. Player A has \$1000, which they can either send to player B, or keep for themselves. If they send the money to player B, then this money gets tripled (so player B receives \$3000). Player B can then either send \$1500 back to player A, or they can keep all the money for themselves. Draw the sequential form of this game. Find the subgame perfect Nash equilibrium using backward induction.

2. Consider the following game. A marmot is trying to decide whether to forage by a lake or in a tree. A tiger is trying to decide whether to hunt by the lake or near the tree. If the marmot and the tiger go to different locations then the tiger doesn't eat (and gets payoff -1) and the marmot does eat (and gets payoff 1). If the marmot and the tiger both go to the lake then the tiger eats the marmot, meaning that the tiger gets payoff 1 and the marmot gets payoff -1. If the marmot and the tiger both go to the tree, there is a probability $\frac{\varepsilon}{2}$ that the marmot gets to escape, so the payoff to the marmot is $-(1 - \varepsilon)$ and the payoff to the tiger is $(1 - \varepsilon)$
 - (a) **3 pts** Write down the matrix for this game
 - (b) **3 pts** Does this game have a Nash Equilibrium in pure strategies?
 - (c) **8 pts** Calculate the equilibrium in mixed strategies as a function of ε . As ε increases, is the marmot more or less likely to go to the lake? How about the tiger?

Question 4 (15pts) Prince is deciding what to have for breakfast between a (pples), b (ananas) and c (repes). Imagine that, on different days, the hotel in which Prince is staying offers him different menus which cover every possible combination of breakfast items (i.e. apples only, bananas only, crepes only, apples and bananas, apples and crepes, bananas and crepes, and apples, bananas and crepes) You as an intrepid reporter write down what Prince chooses from each menu.

We say that choices satisfy the independence of irrelevant alternatives if they satisfy the following property: say x is chosen from some menu A (for example, apples are chosen from apples, bananas and crepes). Now remove some alternative other than x from A . It must be the case that x is still chosen from the resulting menu (so for example, apples must still be chosen from apples and bananas).

1. **5 pts** Imagine Prince has a complete, transitive and reflexive preference relation over breakfast items, and makes choices in order to maximize those preferences (for simplicity,

assume that he is never indifferent between two breakfast items). Show that his choices will satisfy the independence of irrelevant alternatives.

2. **10 pts** We say that alternative x is revealed preferred to alternative y if x is chosen from a menu that includes only y and x (for example, if apples are chosen from apples and bananas, we say that apples are preferred to bananas). Show that, if choices satisfy the independence of irrelevant alternatives, then the revealed preference relation must be transitive (hint: imagine that revealed preferences are intransitive. Show that whatever is chosen from the menu apples, bananas, crepes will lead to a violation of the independence of irrelevant alternatives).