

Economics 3550
Intermediate Microeconomics
Professor Rous
Mid-Term Exam 2
October 29-30, 2003

Name _____ KEY _____
Clearly label all graphs for full credit and
please write legibly; I cannot grade what I
cannot read.

Number of points each question is worth in parentheses.

- 1.(6) You currently eat 4 tacos and 6 hamburgers per week. The price of Tacos is \$2 and the price of hamburgers is \$4. Given your current consumption bundle, the marginal utility of tacos is 12 and the marginal utility of hamburgers is 16.

Are you currently maximizing utility? If not, how do you know, and what should you do about it (more tacos and fewer hamburgers, more hamburgers and fewer tacos, etc)?

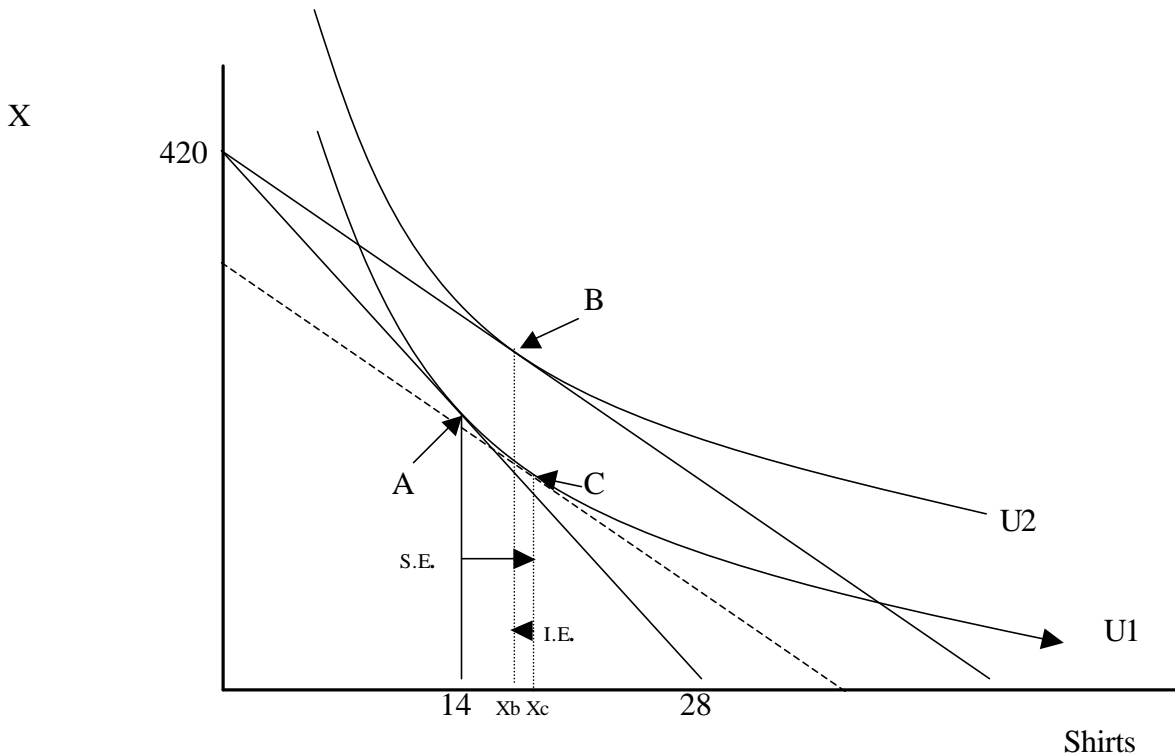
To maximize utility, you have to get the same marginal utility per \$1 spent on the last unit of each type of good you buy. In other words, utility is maximized if:
 $MU_x/P_x = MU_y/P_y$

With the numbers given above, this equality does not hold, you get more bang for a buck from tacos than hamburgers so you should buy more tacos and fewer hamburgers.

2. Say your income is \$420, the price of shirts is \$15 and the price of the composite commodity is \$1.

- a.(5) Draw the budget constraint for shirts below.

See below. Runs through (0,420) and (28,0)



- b.(5) Assuming you spend $\frac{1}{2}$ your income on shirts, draw in an appropriate utility maximizing indifference curve.

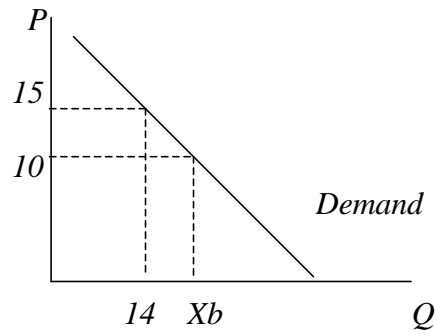
U1 with tangency at 14 shirts. (Point A above).

- c.(12) Now let the price of shirts drop to \$10. Assuming shirts are **inferior, non-Giffin** goods, draw in the new utility maximizing bundle (you no longer necessarily spend $\frac{1}{2}$ your income on shirts). Also demonstrate the income and substitution effects.

When price changes, the Substitution Effect is a move from bundle A to C. This reflects new price ratio, but original level of utility (on U1). Bundle C is also point on original indifference curve tangent to a compensated budget constraint. Then the Income Effect is the move to new optimal bundle on the new budget constraint. Since the price of shirts fell, purchasing power has increased. Since shirts are inferior and the price fell, the move from bundle C to B must be in the same direction as the price change. That is, the increase in purchasing power leads to a decrease in consumption from X_c to X_b . X_b is still greater than 14 since this is not a Giffin good.

- d.(5) How would you have placed the optimal bundle differently if shirts were normal goods? *X_b would be to the right of X_c since the income effect would be in the same direction as the substitution effect.*

- e.(7) Now draw a demand curve for shirts consistent with the above diagram. Make sure to label all relevant features.



- 3.(6) True/False/It depends: The substitution effect always has the opposite sign as the price change. Explain.

True. At the original optimal bundle the $MRS = P_x/P_y$. For the substitution effect, we look to where the MRS of the original indifference curve is equal to the new P_x/P_y . If P_x/P_y increases (because P_x increased), then the MRS will be higher at a lower quantity of X (assuming convexity of preferences). If P_x decreases, then P_x/P_y will decrease and the MRS will be lower at a higher quantity of X . So when P_x increases, the substitution effect will be to consume less and when P_x decreases, the substitution effect will be to consume more.

4. Assume the Todd-O-Matic Company has the following Demand and Total Cost structure. (Hint: use the extra columns to get the information you need to answer the question).

Demand				Total Cost			
P	Q	TR	MR	Q	TC	MC	Profit
				0	100		-100
100	1	100	100	1	130	30	-30
95	2	190	90	2	170	40	20
90	3	270	80	3	225	55	45
85	4	340	70	4	295	70	45
80	5	400	60	5	385	90	15
75	6	450	50	6	495	110	-45

- a.(8) What is the profit maximizing level of output this firm should produce?
 $Q = 4$ where $MR = MC$

Say fixed cost includes the amount paid to a security company to patrol the factory at night. Further assume the security company has increased its fee by \$50.

- b.(6) How will the higher security costs affect the profit maximizing level of output in the short run?
They won't, the firm should still produce 4 units. Most simply, this is because it is a change in fixed cost (does not affect MC or MB) and should be treated as sunk unless they can be avoided. More specifically, this is because losing \$5 is better than paying \$150 in fixed cost.

c.(6) Does your answer change if there is a clause in the contract that states it is possible to end the security contract if the company goes out of business? Explain.

I wasn't as clear as I could have been. Assume the entire fixed cost is the security cost -- then being able to avoid the fixed cost means that although fixed, it is not sunk, and can be avoided.

If you assume that less than \$95 of the original \$100 of fixed cost was security cost, then exiting the industry would not be worth it. For example. If the security cost was \$90 of the original \$100 of fixed cost (and then jumped to \$140 of the fixed costs), then by going out of business you would still lose a fixed cost of \$10, which is worse than the \$5 loss you suffer if $Q = 4$.

On the other hand, if security cost had been \$98, and then jumped to \$148, Then going out of business would be a good deal because only \$2 of fixed costs could not be avoided and it would be better to go out of business to avoid the \$5 loss.

- 5.(7) The Denton Town council wants to have more ice cream cones sold in town by street vendors. There are two plans under consideration. The first would lower the annual licensing fee from \$300 to \$100 and the second would repeal the \$.05 per cone excise tax on ice cream cones. Which plan is likely to lead to increased sales of ice cream cones? Explain.

The license fee does not vary with output. Therefore it is fixed and lowering it will not affect output. The excise tax does vary with output and therefore affects marginal cost. Lowering it will cause output to increase (the town council's goal).

6. Assume the Acme Company has the following production function:
 $Q = (25K * L)^{.5}$ and they are currently using 100 units of K in the short run.
 Say the price of labor is 50 and the price of capital is 200.

a.(6) What is the Acme company's average variable cost function (with AVC as solely a function of Q).

$$Q = 50 * L^{.5}$$

$$Q^2 = 2500L$$

$$L = Q^2/2500$$

$$VC = (P_L * Q^2)/2500; \quad AVC = (P_L * Q)/2500 \text{ or } AVC = (50 * Q)/2500$$

b.(6) If they are using 20 units of labor, what is their $MRTS_{LK}$ (you can use calculus, but you do not have to)?

Students used four different, but equally correct ways to find the answer.

1. You could get the equation for the indifference curve and then take the derivative to find out how much K changes when L changes by one unit. To do this, solve the production function for $K = f(L, Q)$, substituting 200 in for Q. Then you take the derivative of the equation with respect to L. Then, putting in 20 for L, you get the $MRTS_{LK}$.

$$MRTS = -Q^2/25L^2 = -5.0$$

2. You could use the same equation as in (1.) above and substitute 200 for Q . Then compare K when $L = 20$ or $L = 21$ (or compare $L = 20$ to $L = 19$). That change in K tells you the $MRTS$.

The change in K is -4.76 if L is increased by 1 so $MRTS = -4.76$.

3. You could take the derivative of the production function with respect to L to get the MPL and then take the derivative of the production function with respect to K to get the MPK . Then plug in 100 for K and 20 for L in both equations and use the equation $MRTS = MPL/MPK$ to find the $MRTS$.

$$MPL = 25/L^5, MPK = 22.36/2K^5 \quad MRTS = -5.0025$$

4. You could figure out the MPL by comparing output when $K = 100$ and $L = 20$ to output when $K = 100$ and $L = 21$. Then you, similarly, could get MPK by comparing Q when $L = 20$ and K changes from 100 to 101. Again you could use the equation $MRTS = MPL/MPK$ to get $MRTS$.

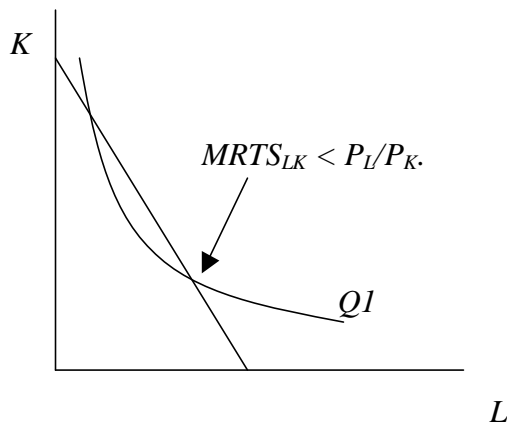
$$MPL = 5.522, MPK = 1.118, MRTS = -4.939.$$

7. (7) The Barkco Company has been producing with $K = 50$ and $L = 25$. With these inputs, the $MRTS_{LK}$ is 1.5. Let the price of labor be 80 and the price of capital be 40, assuming they maintain the same level of output, what is the cost and benefit of hiring one more laborer?

The price of labor is \$80 so the cost of hiring one more laborer is \$80. If they do that, they can, given the $MRTS$, produce the same level of output with 1.5 fewer units of capital. Since capital costs \$40, the benefit of hiring one laborer is \$60 (saving on K).

If you do not know that, can you, (for partial credit), explain whether the firm would be better off with more K and less L or more L and less K ?

To minimize cost, the $MRTS_{LK} = P_L/P_K$. If $MRTS_{LK} < P_L/P_K$ as it is here, the firm should hire more K and less L . Answering this was worth a maximum of 5 pts.



8. (8) Define/Explain the “Expansion Path”

The expansion path is the combinations of K and L that minimize cost as production increases (assuming the prices of inputs do not change). In the short run, a change in output will force the firm off its expansion path (where $MRTS_{LK} \neq P_L/P_K$), as capital is fixed. In the long run however, the firm will be able to adjust both K and L to get back to the cost minimizing input mix and the expansion path. This demonstrates why $LRMC$ is always $<$ $SRMC$.