KEY

ECO 601-001 Final Exam Fall 1998

10 point questions:

1. The gross price elasticity for a good is –1, its income elasticity is +2, and its income share is 0.25. What is its compensated price elasticity?

2. True or False. Briefly explain with a diagram. When the price of good X is \$1, a consumer buys 20 units of X. If the price of X rises to \$1.50, the consumer must \$10 more in income in order to remain at the same level of utility.

3. True or False. Briefly explain with a diagram. When P_x = \$1 and P_y = \$4, Milton consumes X = 60 and Y = 10. When P_x = \$4 and P_y = \$2, Milton consumes X = 20 and Y = 20. Milton is behaving irrationally and is unlikely to have a successful career as an economist.

4. Robinson Crusoe and Friday live on an island. They have identical preferences for the only two commodities that can be cultivated on their island, bananas (B) and goat's meat (G). Crusoe and Friday are currently devoting labor and land to the production of B and G such that the marginal rate of transformation between bananas and goat's meat is 50B:1G. Crusoe's and Friday's preferences are such that their common marginal rate of substitution between the two commodities is 100B:1G. Illustrate this situation with a production possibilities frontier and indifference curves and explain briefly why it is not Pareto optimal.

20 point questions:

5. Given that $Q = 2K^{1/2}L^{1/2}$, and that during the time period to be considered capital is fixed at K=4. The market-determined price of the firm's output is P=\$10. (a) How much labor will this firm want to employ if w=\$10? if w=\$5? (b) Sketch the above relationship between w and L. Is this the firm's demand curve for labor? Why or why not?

6. The economy of Slobovia produces two goods, X and Y. The production function for good X is given by $X = K^{1/2}L^{1/2}$ and the production function for good Y is given by $Y = K^{1/3}L^{2/3}$. K and L are capital and labor inputs used in the production of goods X and Y. The total supplies of capital and labor in Slobovia are fixed at 100 units and 200 units, respectively.
   a) What will be the relationship between the capital-labor ratio in the production of good X to the capital-labor ratio in the production of good Y if the Slobovian economy attains efficiency in production?
   b) Sketch the production possibilities frontier for Slobovia. Your graph should include the vertical and horizontal intercepts and at least one interior point, to indicate whether the PPF is linear or concave.

7. Suppose that the tobacco market is in long-run equilibrium at a price of \$1.50 per pound, and imagine for sake of argumentation that there is absolutely no government intervention in this market. Also suppose that tobacco farming is characterized by a U-shaped long-run average cost curve. Market price elasticity of demand in this perfectly competitive industry is 1.0.
   a) Now, suppose that as a part of the recent tobacco lawsuit settlements, the Department of Agriculture implements a program that requires each tobacco farmer to restrict its tobacco output by 10%, and that it permits no new entry into tobacco farming. Show in diagrams each firm's output and the collective effect on the market price of tobacco. Do you think that tobacco farmers would support such a program? Using your diagram, briefly explain why or why not.
   b) Suppose that instead of requiring each producer to restrict output, the USDA issues operating licenses to tobacco farmers. A lottery is held, and 90% of tobacco farmers get a license to grow tobacco. Obviously the unlucky 10% have to find some other line of business to go into, since they can no longer grow tobacco. Now for the question: Will short-run output fall by 10%? What will happen to the market price of tobacco? Show in a diagram the short-run output and profits of one of the lucky tobacco farmers who was granted a license to grow tobacco.

ECO 601 Final Exam Key Fall 1998

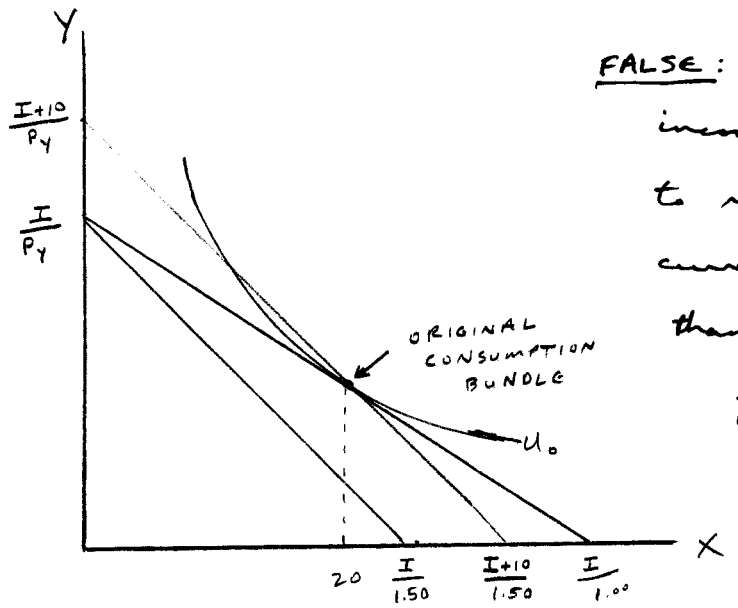
1. Slutsky eq. in elasticities:

$$\varepsilon_{x,P_x} = \varepsilon^{s}_{x,P_x} - s_x \varepsilon_{x,I}$$

$$-1 = \varepsilon^{s}_{x,P_x} - (0.25)(2)$$

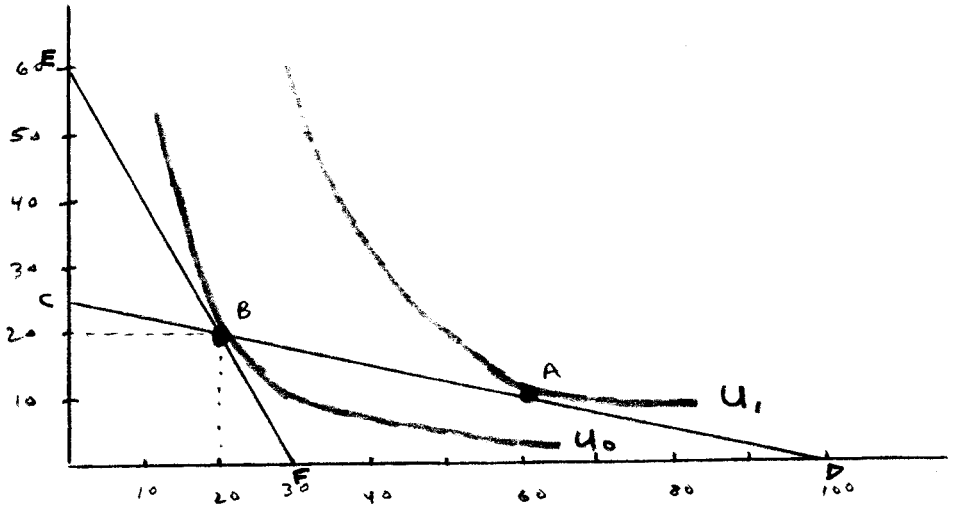
$$\varepsilon^{s}_{x,P_x} = -0.5$$

2.



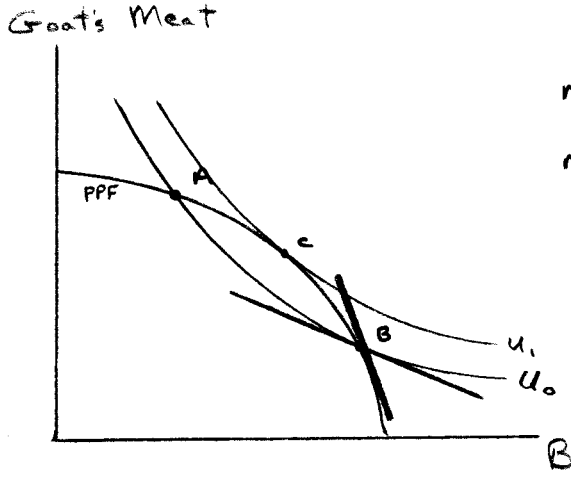
FALSE: $10 increase in income allows the consumer to reach a higher indifference curve than U_0. Less than $10 is required for attaining U_0.

3.



When Milton's budget constraint is CD, he consumes bundle A on IC U_1. When his budget constraint is EF, he consumes bundle B on IC U_0. His behavior is rational. So FALSE.

4.



MRT = slope of PPF = $\frac{1G}{50B} = .02$

MRS = slope of IC = $\frac{1G}{100B} = .01$

slope of PPF > slope of IC and is consistent with point B and not with point A. For efficiency it must be the case that $MRS = MRT$. That would occur at a point like C.

5. $Q = 2K^{1/2}L^{1/2}$ and K is fixed at $K = 4$.

Market price of output is $P = 10$.

(a) Short-run profit maximization dictate that labor be employed such that $MFC_L = MRP_L$.

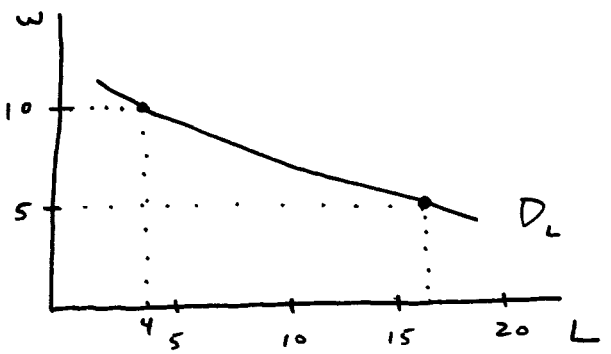
$MRP_L = MP_L \cdot P = 10 \cdot \frac{dQ}{dL} = (10)(2)(4)^{1/2}(\frac{1}{2})(L)^{-1/2}$

$MRP_L = \frac{20}{\sqrt{L}}$

if $w = 5$: $5 = \frac{20}{\sqrt{L}}$, $\sqrt{L} = 4$, $L^* = 16$

if $w = 10$: $10 = \frac{20}{\sqrt{L}}$, $\sqrt{L} = 2$, $L^* = 4$

(b)



If capital is fixed at $K = 4$ and the firm's output price is constant at $P = 10$, then the above relationship is the firm's demand curve for labor.

6. (a) $X = K^{1/2} L^{1/2}$ $\quad Y = K^{1/3} L^{2/3}$

For production efficiency, it is necessary that $MRTS_{L,K}(X) = MRTS_{L,K}(Y)$.

$$MRTS_{L,K}(X) = \frac{MP_L(X)}{MP_K(X)} = \frac{\frac{1}{2} K^{1/2} L^{-1/2}}{\frac{1}{2} K^{-1/2} L^{1/2}} = \frac{K}{L}$$

$$MRTS_{L,K}(Y) = \frac{MP_L(Y)}{MP_K(Y)} = \frac{\frac{2}{3} K^{1/3} L^{-1/3}}{\frac{1}{3} K^{-2/3} L^{2/3}} = \frac{2K}{L}$$

Hence the production of good Y will be <u>twice</u> as capital intensive as the production of good X if inputs are employed efficiently.

(b) $K = 100$ and $L = 200$

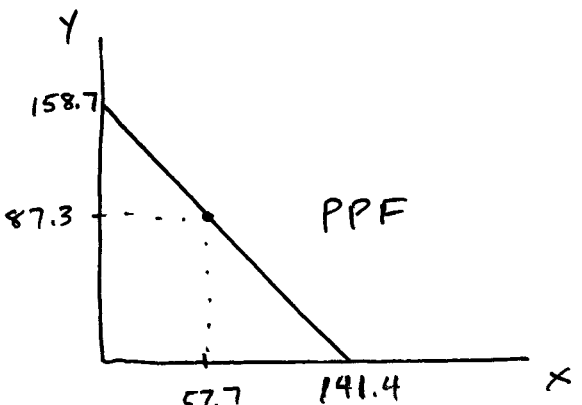
PPF vertical intercept $\Rightarrow$ $Y = (100)^{1/3} (200)^{2/3} = 158.7$

PPF horizontal intercept $\Rightarrow$ $X = (100)^{1/2} (200)^{1/2} = 141.4$

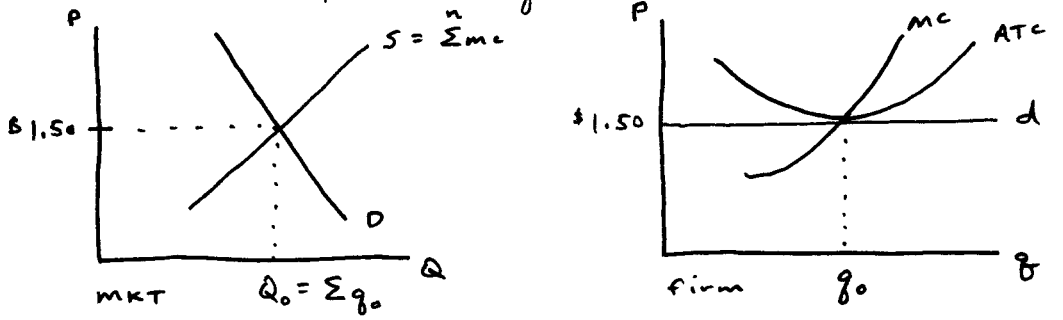
interior point on PPF: let $L_X = 100$ and $L_Y = 100$, using up all 200 unit of labor. Let $K_X = 33.3$ and $K_Y = 66.7$, using up all 100 units of capital. Note that the production of good Y is twice as capital intensive as the production of good X.

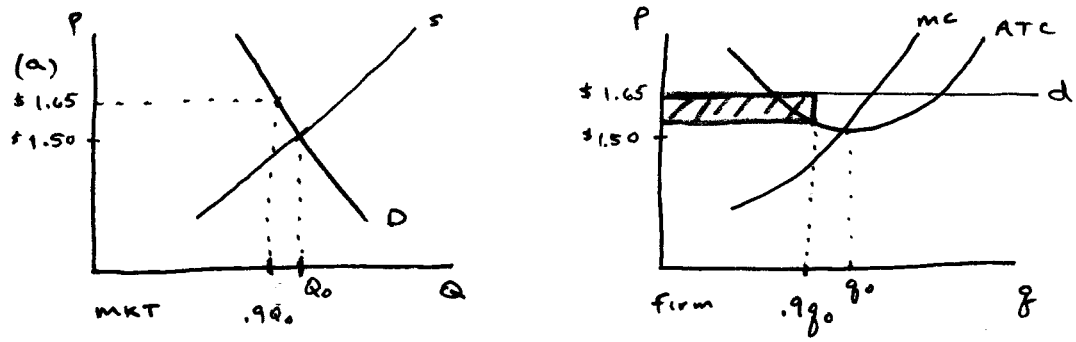
$X = (33.3)^{1/2} (100)^{1/2} = 57.7$

$Y = (66.7)^{1/3} (100)^{2/3} = 87.3$

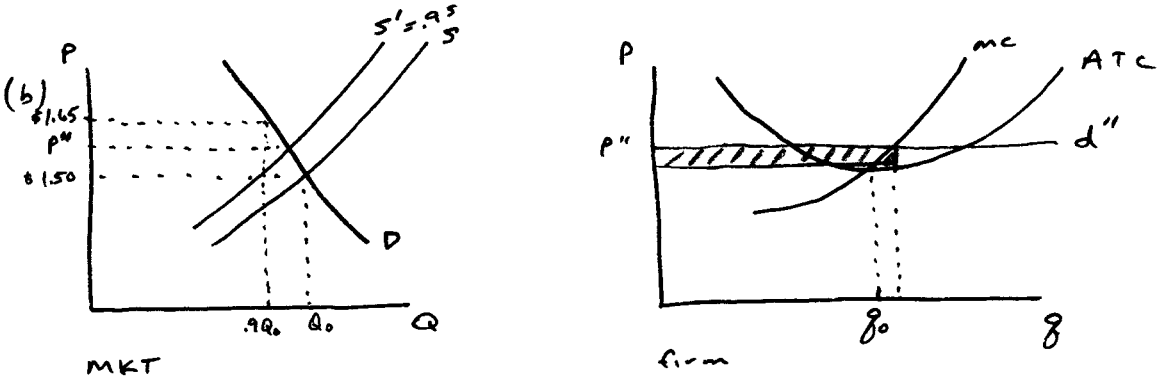


7. Initial long-run equilibrium:





Of each firm restricts output by 10% and there is no entry, market output falls by 10% and price rises by 10% to $1.65. The representative firm earns positive economic profits as a result of this program.



With 10% fewer farmers, the new market supply curve will shift left by 10%. Price will rise, but by less than 10%, because the remaining farmers will produce more than q_0 at price P". Short-run market output will fall by less than 10%.

KEY

ECO 601 Final Exam Fall 1999

1. (15 pts.) Buffy's current wealth (which includes her car and all of her other assets) is $100,000. The chance that she will lose her $20,000 automobile through theft, fire, or accident in the next year is 25%. Buffy's von Neumann-Morganstern utility of wealth function is logarithmic, i.e. U(W)=ln(W).
   a) In a world where administrative costs are zero, what would an actuarially fair premium be?
   b) If Buffy can buy insurance at this price, should she do so? Calculate her utility if she does and if she does not buy insurance for her automobile.
   c) What is the maximum premium that Buffy would be willing to pay for auto insurance?

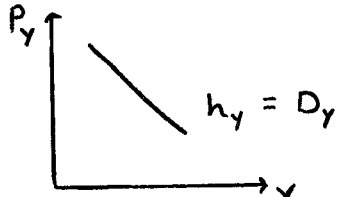
2. (20 pts.) Suppose that you are granted a monopoly charter by the Lexington city council to operate a golf course. You can produce any level of output that you wish at a constant marginal cost of $5 per unit. Since you own the only golf course in town, anyone who wants to play must play at your course. All golfers are alike, and each one has an annual demand for golf that is given by Q=70-2P, where Q refers to output and P refers to price.
   a) What are the monopoly's profit-maximizing price and output? How much profit do you make off of each golfer in a year?
   b) In a diagram, illustrate the deadweight loss due to this monopoly. Calculate the dollar amount of the deadweight loss.
   c) Suppose that you decide to sell an annual pass that permits a golfer to pay an annual fee of A and then pay a price per round of golf of P. What should the annual fee and the price per round be, and how much profit will you make from each golfer in a year? Illustrate your answer.

3. (15 pts.) While during the day you are occupied with running a golf course, at night you are back at Arby's, managing your restaurant and making sure that your employees don't steal you blind. Your production function is given by $Q=10K^{1/2}L^{1/2}$. You are constrained to K=16 in the short run. Assume that the price of a meal is set by competitive market forces and is $3 per meal. How many workers will you hire if you have to pay your workers $6 per hour? How many if you have to pay w=$12?

4. (20 pts.) When you go back home to western Kentucky for the holidays, your cousins have a number of questions for you. They know that you are studying economics, and they want to ask some questions about their family business, raising hogs. The industry is currently in long-run equilibrium, with hogs selling for $.50 per pound at the slaughterhouse. Your cousins use the same technology to produce hogs that everyone else uses—small family-owned farms, outdoor pens, mud, and slop. There are no locational advantages, and farmers from Mississippi to Minnesota can produce hogs at the same level of cost.
   a) Illustrate the initial long-run equilibrium, with separate diagrams for a typical firm and for the hog market.
   b) One of your cousins shows you an article in the current issue of *Progressive Farmer* magazine: Some hog producers are experimenting with new production methods that use mass production techniques. These new "factory farms" are much bigger and can produce hogs at 20% lower cost than existing family-owned farms. Your cousin wants to know, what does the future hold for the hog industry? Provide her with an analysis, telling her what will happen to the price of hogs, market output, output of a typical firm, and profits. Use diagrams to illustrate your answer.

5. (15 pts.) A consumer buys 80 units of good X and 100 units of good Y, along with positive quantities of many other goods. Suppose that the price of X falls by $.50 while at the same time the price of Y rises by $.40 per unit. Everything else stays the same. Will this consumer buy more, less, or the same amount of good X? Does your answer depend on knowing what the income elasticity of demand for X is?

6. (15 pts.) Suppose a two-good world. Bart's Hicksian and Marshallian demand curves for good Y coincide, as illustrated below. Now, given what you know about good Y, and what that implies about good X, sketch the income and substitution effects for good X resulting from a price decrease for good X.



Eco 601 Final Exam KEY Fall 1999

1. (a) Expected wealth : $100,000 w/ prob 3/4
80,000 w/ prob 1/4

$E(w) = \frac{3}{4}(100,000) + \frac{1}{4}(80,000) = \$95,000$

so actuarily fair premium = $5000

(b) With insurance she will have $95,000 with certainty, so $U = \ln(95,000) = 11.462$
without insurance her expected utility is $\frac{1}{4}\ln(80,000) + \frac{3}{4}\ln(100,000) = 11.457$
So she should take the insurance

(c) She would pay up to the amount that would leave her indifferent with the no-insurance gamble, where $U = 11.457$

$U(100,000 - x) = 11.457$

$\ln(100,000 - x) = 11.457$

$x = \$5426$, which is the maximum premium she would pay

2. $MC = 5 \qquad Q = 70 - 2P \Rightarrow P = 35 - \frac{Q}{2}$

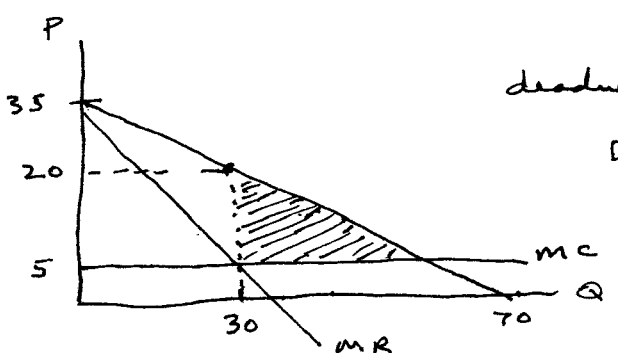
(a) $TR = P(Q)\cdot Q = 35Q - \frac{1}{2}Q^2$

$MR = \frac{dTR}{dQ} = 35 - Q$

$MR = MC \Rightarrow 35 - Q = 5$, so $Q^* = 30$, $P^* = 20$

$\pi = 600 - 150 = \$450$

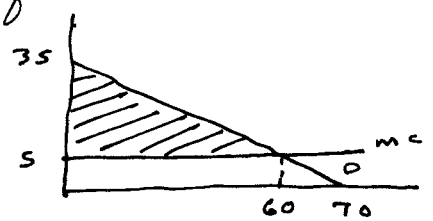
(b)



deadweight loss triangle

$DWL = \frac{1}{2}(15)(30) = \$225$

2. (c) Perfectly price-discriminating monopolist could extract all consumer's surplus by setting $P = MC$ and charging an annual fixed fee equal to entire consumer's surplus:



fee $= \frac{1}{2}(30)(60) = \$900$

so $\pi = \$900$ per golfer per year.

3. $Q = 10K^{1/2}L^{1/2}$, $\bar{K} = 16$, $P = \$3$

$MP_L = 5K^{1/2}L^{-1/2} = 20L^{-1/2}$

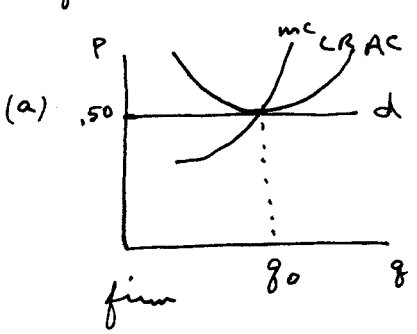
profit-maximizing input choice is where

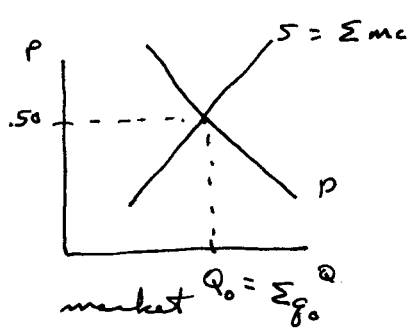
$w = MRP_L = P \cdot MP_L$

if $w = 6$, then $6 = (3)(20L^{-1/2})$ and $L = 100$

if $w = 12$, then $12 = 60L^{-1/2}$ and $L = 25$

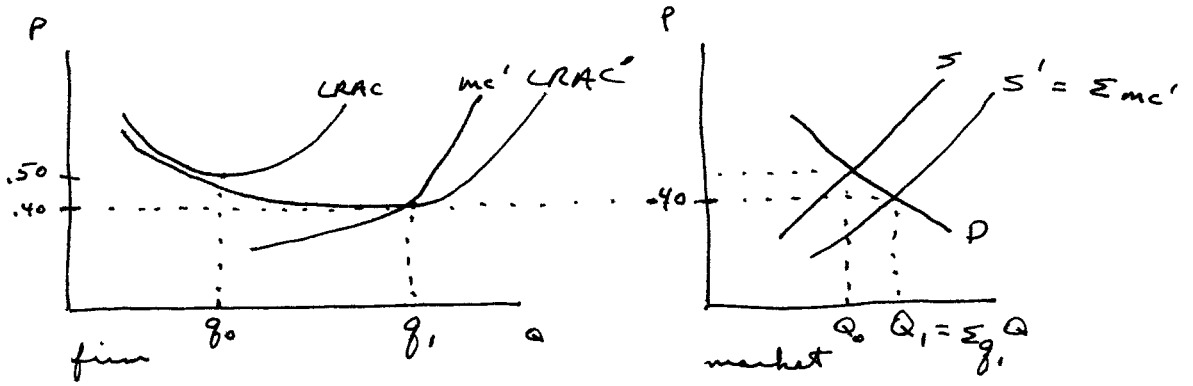
4. (a)





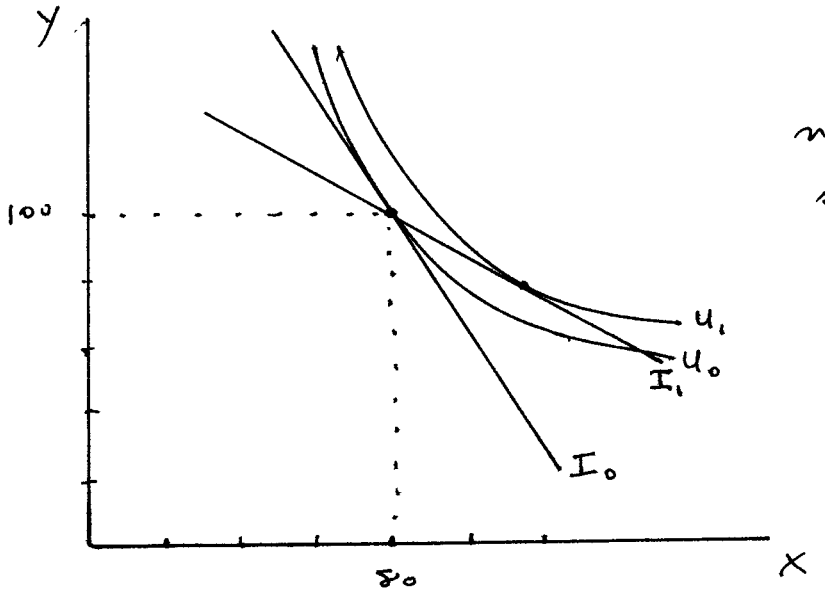
individual farmer earns zero economic profit at $P = \$.50$

4. (6)



Mass-production techniques cause the LRAC curve to shift downward to LRAC', which bottoms out at $.40. Farmers who do not adopt the new technology cannot survive. The new long-run equilibrium will be characterized by lower market price ($.40), higher market output (Q_1), higher output for typical firm (q_1), and zero economic profit for surviving firms in the long run.

5.

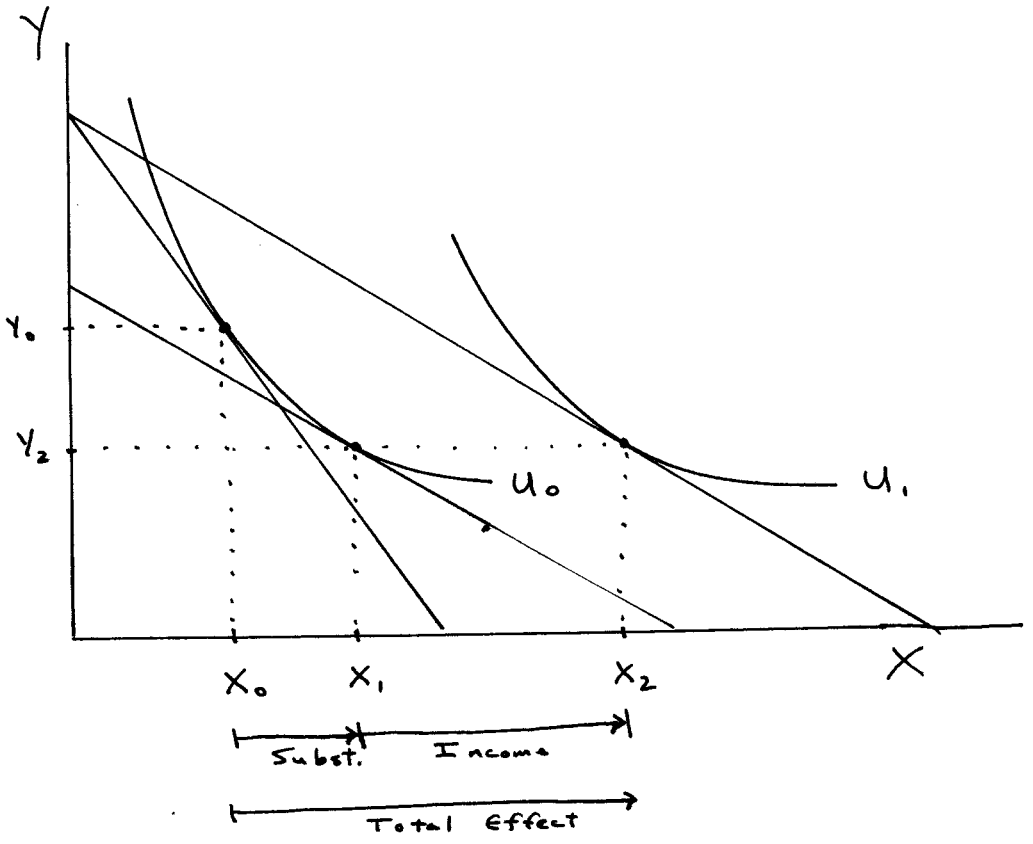


no income effect so consumption of X increases

I_0 - original prices of X and Y

I_1 - goes through original consumption bundle, but P_x is $.50 lower and P_y is $.40 higher

6.



Original consumption bundle X_0, Y_0

Price of X falls, new consumption bundle is X_2, Y_2

Since $h_Y = D_Y$, there is no income effect for good Y, i.e. $\frac{dY}{dI} = 0$. In a two-good world, that means that $\frac{dX}{dI} > 0$, so X is a normal good. Income effect for good X reinforces the substitution effect.