

Recitation 5 Answer Key

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Week 5 (9/25-10/1): Seller Choice (cont'd)

Recap of this week's most important concepts:

- Efficiency:
 - Definition of Pareto Efficiency
 - Efficient quantity such that $MB = MC$. Consequence: total surplus is maximized
 - If quantity is such that $MB \neq MC$: inefficiency (*consequence*: deadweight loss).
 - Identify deadweight loss on a graph and compute the area.
- Perfect Competition:
 - Firm is price taker, so it faces perfectly elastic firm demand: $MR = P$ (where P is the market price, taken as given by the firm)
 - Identify shut-down price (min AVC) and break-even price (min ATC)
 - Firm's short-run supply is MC above shut-down price
 - From firm's supply to market supply
 - Shifts of supply curve
 - Price elasticity of supply (formula, factors, shape of inelastic / elastic / unit-elastic supply curves)
 - Market Equilibrium:
 - * Solve for equilibrium price and quantity (equation and on graph).
 - * Identify new equilibrium (mathematically and graphically) if demand / supply changes
 - * Excess demand or excess supply
 - Efficiency
 - Changes in market supply and market demand
 - From short-run (with positive or negative profits) to long-run equilibrium (with zero profits): in the long-run equilibrium price and individual quantity are at min ATC ; determine number of firms in the long-run equilibrium;
 - Changes in equilibrium: how change in demand or change in costs affect new short-run equilibrium and new long-run equilibrium

- Group blue: question 8 Midterm Fall 2021

Jenna and Kate are contemplating starting a business together under three different business models: B1, B2, and B3. Jenna and Kate have different types of skills which are utilized to varying proportions under the three models. Each person will be compensated according to their contribution. The table below shows Jenna's and Kate's compensations with each business model.

	Jenna	Kate
B1	4,000	2,900
B2	4,200	2,700
B3	3,000	3,000

Which business model is not Pareto efficient?

- B1 is not Pareto efficient
- B2 is not Pareto efficient
- B3 is not Pareto efficient
- All business models are Pareto efficient

Solution: d. B1 is Pareto efficient because making Jenna better off by switching to B2 would make Kate worse off, and making Kate better off by switching to B3 would make Jenna worse off. B2 is Pareto efficient because it's the business model with the highest possible payoff for Jenna (so another model would make Jenna worse off), and B3 is Pareto efficient because it's the business model with the highest possible payoff for Kate (so another model would make Kate worse off).

- Group yellow: Question 5 Midterm 2 Fall 2010

Assume Corn & Company produces corn, and the market for corn is perfectly competitive. The price of corn is \$8. $TC = 2 + 2q^2$ and $MC = 4q$. Which of the following is true?

- They will produce two units of corn
- There will be entry into this industry in the long-run
- \$8 is greater than the minimum of the ATC curve
- All of the above are true

Solution: d. The minimum of ATC is such that $ATC = MC$, i.e. $2/q + 2q = 4q \Rightarrow q = 1$. Therefore, $\min ATC = 4$, which is lower than the market price (so c. is correct). Since $\min ATC \leq P$, short run profits are positive so there will be entry in the long-run (so b. is correct). Firms maximize profits if they produce the quantity such that $P = MC$: $8 = 4q \Rightarrow q = 2$ (so a. is correct).

- Group purple: Question 5 Midterm 1 Fall 2017

Ice cream and yoghurt are substitutes in consumption, and both are normal goods. Both ice cream and yoghurt are produced with cow milk. Which of the following will certainly NOT lead to an increase in the equilibrium quantity of ice cream?

- Increase in consumer income
- A baby boom in the cow population
- A technological improvement in the production of yoghurt
- Successful advertising campaign on the health benefits of ice cream cones

Solution: c. Ice cream is a normal good so an increase in consumer income will increase demand for ice cream (shift out) so it will increase the equilibrium quantity of ice cream (so a. is false). A baby boom in the cow population will increase (shift out) the production (supply) of milk so the price of milk will go down, which makes ice cream production cheaper so the supply of ice cream will increase (shift out) which will increase the equilibrium quantity of ice cream (so b. is false). A technological improvement in yoghurt production will increase (shift out) the supply of yoghurt so yoghurt becomes cheaper, which decreases the demand for substitutes like ice cream, so the equilibrium quantity of ice cream decrease (so c. is true). Successful advertising for ice cream will increase (shift out) the demand for ice cream which will increase the equilibrium quantity of ice cream (so d. is false).

(If times allows)

1. Jim is a florist who competes in a perfectly competitive flower market. The price of fertilizer, which represents a variable cost, increases. Which of the following is a result of this change?
 - Jim's shut down price decreases
 - Jim's short run supply increases
 - Jim's total costs decrease
 - None of the above

Solution: d. An increase in variable cost leads to an increase in AVC , ATC and MC . The shut down price is the minimum of AVC so it increases, so a. is incorrect. The short-run supply is the MC above the shut down price. Since the MC increases, the short-run supply decreases (i.e. shifts in or pivots counterclockwise), so B is incorrect. The total cost decreases if the variable cost decreases. Here it is not clear how the variable cost changes: it is higher at every quantity, but Jim decreases the quantity produced, so the variable cost – and therefore the total cost – can either increase or decrease, so C is incorrect.

2. Suppose the market for apples is in a long run equilibrium. A new study shows that plums, a substitute for apples, can prevent cancer. How does the new long-run equilibrium compare with the initial one?
- I. The price is lower
 - II. There are fewer firms in operation
- a. I. only
 - b. II. only
 - c. I. and II.
 - d. Neither I. nor II.

Solution: b. In the initial long run equilibrium firms are making 0 profits. The demand for apples decreases so the price of apples decreases (note that here the new study has two effects on the demand for apples: a direct effect that shifts consumption away from apples toward plums, and an indirect effect that increases demand for apples because the price of plums will increase. We assume the direct effect is the strongest). In the new short run equilibrium, apple producers are making losses. As we move to the long-run, there will be exit so in the new long-run equilibrium there are fewer firms in operation so II. is correct. Exit decreases supply which increases the price. In the new long-run equilibrium the price is back to its initial level (so that each firm is back to 0 profit) so I. is incorrect

The next questions are for your own practice.

3. The market for heaters is perfectly competitive, and the industry is currently in a long run equilibrium. Suppose the government imposes a new annual licensing fee on all firms in the industry. Let N be the number of firms, Q be the quantity supplied at the market level, and P the market price. In the new long run equilibrium:
- I. N is higher
 - II. Q is higher
 - III. P is higher
- a. I only
 - b. III only
 - c. I and II only
 - d. I and III only

- e. II and III only
- f. I, II and III
- g. neither I, II nor III

Solution: b. The licensing fee is a fixed cost. If fixed cost increases, the ATC curve shifts up, so in the short run firms are making negative profits. So in the long run some firms will exit (so N is lower), so market supply will shift in, so the market price will increase (P is higher) and the market quantity decreases (Q is lower), up to the point where it is equal to the minimum of the new ATC, such that firms are back to zero profits. Since the long-run equilibrium price has increased, it now intersects the MC at a higher individual quantity, so each firm produced a higher quantity than in the initial long-run equilibrium. The market quantity is lower because there are fewer firms in the market.

4. Consider a perfectly competitive market. Currently the market is in the long-run equilibrium. All firms are identical. Which of the following is true?
 - I. Each firm is producing at a quantity q^* such that marginal cost equals average total cost.
 - II. Each firm is producing at a quantity q^* such that the lowest possible average total cost is achieved.
 - III. It is impossible that some firms now are earning strictly positive profits.
 - IV. It is impossible that some firms now are earning strictly positive producer surplus.
 - a. I and II
 - b. I, II and III
 - c. I, II, III and IV
 - d. II and III

Solution: b. With perfect competition, $MR = P$. Moreover, in the long run equilibrium each firm maximizes its profit and makes zero profit, so $MC = MR$ and $P = ATC$. As a result, in the long run equilibrium we must have $MC = ATC$, so I. is correct. We know that MC intersects ATC at its minimum, so II. is correct. In the long run equilibrium firms make zero profit ($\pi_{LR} = 0$), so III. is correct. Producer surplus is $PS = \pi + FC$, so as long as $FC > 0$, firms earn a positive producer surplus – so IV. is not correct.

5. Acme Inc. is a firm with normal shaped cost curves. They hire a consultant who tells them they should decrease production yet stay in business despite making a loss. Which of the following must be true about their original point of production?

- I. $P > MC$
- II. $MR < MC$
- III. $P > \min AVC$
- IV. $P > ATC$

- a. I only
- b. II only
- c. III only
- d. I and II
- e. II and III
- f. I, II, and III
- g. They all must be true

Solution: e. I. is not correct while II. is correct, because if they must decrease production it means that marginal cost exceeds marginal benefit: $P = MR < MC$. III. is correct because they must stay in business instead of shutting down. IV. is not correct because they are making a loss.

6. Eric and Lisa live side by side and share a driveway. They are considering paving their shared driveway at a cost of \$5,000. The benefit to Eric from paving is equal to \$2,500 and the benefit to Lisa is \$4,000. If each pays half of the cost of paving the driveway then the outcome will be:
- a. inefficient.
 - b. efficient for Lisa but inefficient for Eric.
 - c. efficient for Eric but inefficient for Lisa.
 - d. efficient.

Solution: d. If each pays half of the cost of paving, each of them pays \$2,500. So Eric's net benefit will be $\$2,500 - \$2,500 = \$0$ and Lisa's net benefit will be $\$4,000 - \$2,500 = \$1,500$. So Eric is as well off as if the driveway wasn't paved, and Lisa is strictly better off. Therefore, it is efficient to pave the driveway.

7. Suppose that the market for milk is perfectly competitive. Suppose that each producer's total cost is given by $TC(q) = 4 + q + q^2$ and each producer's output(q^*) in the long-run equilibrium is 2. Find the long-run equilibrium price P^* .
- a. 1
 - b. 2

- c. 3
- d. 4
- e. 5

Solution: e. In the long run equilibrium the profit is 0 so $P^* = ATC(q^*)$. $ATC = 4/q + 1 + q$ so $ATC(q^*) = 4/2 + 1 + 2 = 5$.

8. A local market for bananas has demand $Q_D = 10 - P$ and supply $Q_S = P$. An unexpected fire reduces the quantity supplied at every price by 2 units. Which of the following is the producer surplus after the fire?
- a. 12.5
 - b. 8
 - c. 16
 - d. 10

Solution: b. The new supply equation is $Q'_S = P - 2$, or $P = Q'_S + 2$. It intersects demand when $10 - P = P - 2$, i.e. $P^* = 6$ and $Q^* = 4$. The producer surplus is the area below P^* , above supply (and above the x-axis), for all quantities up to Q^* . $PS = 8$.

9. A perfectly competitive firm faces the following costs: $FC = 108$, $AVC = 40 + 3q$ and $MC = 40 + 6q$. What is the equilibrium quantity in the long run?
- a. 5
 - b. 6
 - c. 10
 - d. 0

Solution: b. The long-run equilibrium price is the minimum of ATC (break-even price), such that ATC intersects MC. ATC is $ATC = AVC = AFC = 40 + 3q + \frac{108}{q}$, so $ATC = MC$ if $40 + 3q + \frac{108}{q} = 40 + 6q$, i.e. $q = 6$.