CB2400 Exercises

1. Fundamental Economic Issues

1. Economics is the study of:
   A) the distribution of surplus goods to those in need.
   B) affluence in a morally bankrupt world.
   C) the choices we make because of scarcity.
   D) ways to reduce wants to eliminate the problem of scarcity

Answer: C

2. During the summer you decide to have a trip to Japan, which precludes you from working at your usual summer job in which you normally earn $6000 for the summer. The trip costs you $4000 that you may use to buy a digital camera. The opportunity cost of having a trip is
   A) The $6000 income forgone.
   B) The digital camera forgone.
   C) The $6000 income or the digital camera forgone depending on your preference.
   D) The $6000 income and the digital camera forgone.

Answer: D

Opportunity cost is the value of the next best alternative forgone.

In this example, you have an implicit cost of $6000 and an explicit cost of $4000. If you choose to have a trip, you will lose both the income and the camera.

3. An example of opportunity cost
   A) is sweets given up by a person who would never eat them even if he or she could.
   B) for a professor of economics is the pleasure that he or she derives from teaching economics.
   C) is the Chinese food that you gave up when you chose to eat Italian food.
   D) is the grants given by government you pay to attend college.
   E) is the price paid for a ticket when you go to the movies.

Answer: C

B is the benefit of the chosen alternative. E is a sunk cost.

4. The question “Should movies or compact discs be produced?”is an example of the
   A) what question.
   B) how question.
   C) where question.
   D) who question.

Answer: A

5. When a country builds a dam using few machines and a great deal of labor, it is answering the question.
   A) “what”
   B) “how”
   C) “where”
   D) “for whom”

Answer: B

6. In the figure above,
   A) moving from point b to point c would require better technology.
   B) some resources must be unemployed at point c.
   C) opportunity costs are decreasing.
   D) point a is efficient.

Answer: A

7. The fact that individual productive resources are NOT equally useful in all activities
   A) implies that a production possibilities curve will be bowed outward.
   B) implies a linear production curve curve.
   C) implies a downward sloping production possibilities curve.
   D) the opportunity costs are constant.

Answer: A

Consider moving from 100% K to 100% C. At first, you want to allocate the production factors that are most useful in producing C, so you can produce at most C as possible while still producing K. Later on, you will have to use less efficient factors to produce C, so the opportunity cost of producing C will increase. Therefore PPC is concave to the origin.

2. Supply and Demand

1. A drop in the price of a compact disc shifts the demand curve for prerecorded tapes leftward. From that you know compact discs and prerecorded tapes are
   A) complements.
   B) substitutes.
   C) inferior goods.
   D) normal goods.

Answer: B

$P_{\text{CD}} \downarrow \Rightarrow Q_{\text{CD}} \uparrow \Rightarrow Q_{\text{Tape}} \downarrow$

2. People come to expect that the price of a gallon of gasoline will rise next week. As a result,
   A) today's supply of gasoline increases.
   B) today's demand for gasoline increases.
   C) the price of a gallon of gasoline falls today.
   D) next week's supply of gasoline decreases.

Answer: B

$P_{\text{Future}} \uparrow \Rightarrow Q^D_{\text{Today}} \uparrow, Q^S_{\text{Today}} \downarrow$

3. If income decreases or the price of a complement rises,
   A) the demand curve for a normal good shifts leftward.
   B) the demand curve for a normal good shifts rightward.
   C) there is an upward movement along the demand curve for the good.
   D) there is a downward movement along the demand curve for the good.

Answer: A

- income $\downarrow \Rightarrow Q^D \downarrow$
- $P_{\text{Complement}} \uparrow Q^D_{\text{Complement}} \downarrow \Rightarrow Q^D \downarrow$

4. The quantity supplied of a good is
   A) the same thing as the quantity demanded at each price.
   B) the amount that the producers are planning to sell at a particular price during a given time period.
   C) equal to the difference between the quantity available and the quantity desired by all consumers and producers.
   D) the amount the firm would sell if it faced no resource constraints.

Answer: B

C is called the surplus (or shortage if negative).

5. Which of the following is NOT held constant while moving along a supply curve?
   A) Expected future prices.
   B) The number of sellers.
   C) The price of the good itself.
   D) Prices of resources used in production.

Answer: C

6. Over the past decade technological improvements that have lowered the cost of producing an automobile have increased
   A) both the supply and the demand for automobiles.
   B) the supply but not the demand for automobiles.
   C) the demand but not the supply of automobiles.
   D) neither the supply nor the demand for automobiles.

Answer: B

7. Which of the following causes an increase in the quantity supplied of good X but NOT in the supply of good X?
   A) A reduction in the price of resources used to produce X.
   B) An improvement in the technology for producing X.
   C) An increase in the price of good Y, a complement in the production of X.
   D) An increase in the price of X.

Answer: D

A change in quantity supplied is incurred by a change in own-price.

A change in supply is incurred by a change in non-owner-price supply determinants.

8. The price of a good will fall if
   A) there is a surplus at the current price.
   B) the current price is less than the equilibrium price.
   C) the quantity demanded exceeds the quantity supplied.
   D) the price of a complement falls.

Answer: A

A. $Q^S > Q^D \Rightarrow P > P^*$

C. $Q^D > Q^S \Rightarrow P < P^*$

D. $P_{\text{Complement}} \downarrow \Rightarrow Q^D_{\text{Complement}} \uparrow \Rightarrow Q^D \uparrow \Rightarrow P^* \uparrow$

9. The above figure represents the market for oil. When a major refinery is destroyed by a hurricane, the

A) demand curve for oil shifts from D1 to D2 and the supply curve for oil will not shift.
B) demand curve for oil shifts from D1 to D2 and the supply curve for oil shifts from S2 to S1.
C) demand curve for oil will not shift, and the supply curve for oil shifts from S2 to S1.
D) demand curve for oil will not shift, and the supply curve for oil shifts from S1 to S2.

(D1 is on the left of D2, S1 is on the left of S2)

Answer: C

10. Let Q_d stand for the quantity demanded, Q_s stand for the quantity supplied, and P stand for price. If $Q_d = 20–2P$ and $Q_s = 5 + 3P$, then the equilibrium quantity is

Answer: 14

$Q_d = Q_s \Rightarrow 20 - 2P = 5 + 3P \Rightarrow P = 3, Q = 14$

11. Consider a (competitive) market with 200 consumers and 100 sellers. All the consumers have the same individual demand function $Q_d = 75 - 2P$ and all the sellers have the same individual supply function $Q_s = 50 + P$. The equilibrium price and quantity in this market are

Answer: $P = 20, Q = 7000$

Market demand $Q_D = 200 \times (75 - 2P) = 15000 - 400P$

Market supply $Q_S = 100 \times (50 + P) = 5000 + 100P$

$Q_D = Q_S \Rightarrow P = 20, Q = 7000$

3. Elasticity

1. The price elasticity of demand measures
A) how often the price of a good changes.
B) the slope of a budget curve.
C) how sensitive the quantity demanded is to changes in demand.
D) the responsiveness of the quantity demanded to changes in price.

Answer: D

2. If a rightward shift of the supply curve leads to a 6 percent decrease in the price and a 5 percent increase in the quantity demanded, the price elasticity of demand is

Answer: 0.83

3. The table above gives the demand schedule for snow peas. The price elasticity of demand increased from \$6.00 to \$7.00 per bushel is (please use point elasticity of demand in your calculation)

P	Q_D
8	2000
7	4000
6	6000
5	8000
4	10000

P	Q_D
3	12000

Answer: 2.0

$$\epsilon_{Q^D,P} = \frac{\Delta Q^D/Q^D}{\Delta P/P} = \frac{(4000-6000)/6000}{(7-6)/6} = -2.0$$

4. At a local ice cream store, when the price of half-gallons of chocolate ice cream was lowered by fifty cents per half-gallon, total revenue from the sale of chocolate ice cream decreased. This result indicates that

Answer: The demand for chocolate ice cream is inelastic.

5. The more substitutes available for a product,
   A) the larger is its price elasticity of demand.
   B) the smaller is its income elasticity of demand.
   C) the smaller is its price elasticity of demand.
   D) the larger is its income elasticity of demand.

Answer: A

6. Florida State University has just lowered the price of its season football tickets from $350 to $300. As a result, there was an increase in the number of season tickets purchased from 43000 to 47000. Using mid-point method, the price elasticity of demand for season tickets equals

Answer: 0.58

$$\epsilon_{Q^D,P} = \frac{\Delta Q^D/Q^D}{\Delta P/P} = \frac{(47000-43000)/45000}{(300-350)/325} = -0.58$$

7. The cross elasticity of demand between apples and oranges is defined as
   A) the percentage change in the quantity of apples demanded divided by the percentage change in the price of oranges.
   B) the price elasticity of demand for apples divided by the price elasticity of demand for oranges.
   C) the percentage change in the quantity of apples demanded divided by the percentage change in the quantity of oranges demanded.
   D) the change in the quantity of apples demanded divided by the change in the quantity of oranges demanded.

Answer: A

$$\epsilon_{Q_a^D,P_o} = \frac{\Delta Q_a^D/Q_a^D}{\Delta P_o/P_o}$$

8. The greater the substitutability between Northwest timber and Southeast timber, the is the cross price elasticity of demand between timber from the two regions and the is the own price elasticity of demand for Northwest timber.
   A) smaller; smaller
   B) smaller; larger
   C) larger; smaller
   D) larger; larger

Answer: D

If a good has a close substitute, when its own price P_X increases, consumers will switch to the substitute, so Q_X^D will decrease, Q_Y^D will increase.

Therefore, cross price elasticity $\epsilon_{Q_Y^D,P_X}$ will be larger, and own price elasticity $\epsilon_{Q_X^D,P_X}$ will be larger.

9. In the above figure, if the price of good A increases from P2 to P1 and the demand for good B decreases from D1 to D2, then goods A and B

A) are substitute goods.
B) are inferior goods.
C) will have a negative cross elasticity of demand.
D) are both price elastic but not perfectly price elastic.

Answer: C

Cross price elasticity $\epsilon_{Q_B^D,P_A} = \frac{\Delta Q_B^D/Q_B^D}{\Delta P_A/P_A}$

since $\Delta Q_B^D < 0, \Delta P_A > 0$, $\epsilon_{Q_B^D,P_A} < 0$

A and B are substitutes.

D. We cannot infer the (own) price elasticity of demand from the information given.

10.When the price of gasoline rises, people do not drive significantly less than before in the short-run. If the price of gasoline stays high, people eventually replace their cars with more fuel-efficient/hybrid models. As a result,
A) the long-run demand for gasoline falls.
B) the short-run demand for gasoline is less elastic than the long-run demand.
C) the short-run demand for gasoline is more elastic than the long-run demand.
D) the price of gasoline is forced down to its original level.

Answer: B

Short-run demand for gasoline is inelastic, long-run demand for gasoline is elastic.

[11-12] Suppose the market demand functions for apples and bananas are respectively

$Q_a^d = 2500 - 300P_a + 200P_b$

$Q_b^d = 7500 + 250P_a - 500P_b$

The current prices are given by $P_a = \$5, P_b = \$7$.

11. What is the price elasticity (in absolute value) of Q_a^d?

Answer: 0.625

Insert $P_b = 7$ into Q_a^d, we get $Q_a^d = 3900 - 300P_a$.

At $P_a = 5$, $Q_a^d = 2400$.

$\epsilon_{Q_a^d,P_a} = \frac{\Delta Q_a^d/Q_a^d}{\Delta P_a/P_a} = \frac{(-300\Delta P_a)/2400}{\Delta P_a/5} = -\frac{5}{8} = -0.625$

12. What is the cross elasticity of demand $\epsilon_{Q_b^d,P_a}$?

Answer: 0.238

Insert $P_b = 7$ into Q_b^d, we get $Q_b^d = 4000 + 250P_a$.

At $P_a = 5$, $Q_b^d = 5250$.

$\epsilon_{Q_b^d,P_a} = \frac{\Delta Q_b^d/Q_b^d}{\Delta P_a/P_a} = \frac{(+250\Delta P_a)/5250}{\Delta P_a/5} = \frac{5}{21} = 0.238$

4. Theory of Consumer

1. The table above shows the total utility from the two goods Freddy likes to consume. Freddy's marginal utility
   A) increases from 25 to 50 as he consumes more fruit drinks
   B) decreases from 40 when he eats one bag of Fritos to 35 when he eats one more bag.
   C) increases from 40 when he eats one bag of Fritos to 75 when he eats one more bag.
   D) from consuming Fritos is more than the marginal utility from consuming an equal number of fruit drinks

Q	TU_{Fritos}	TU_{Drinks}
0	0	0
1	40	50
2	75	95
3	105	135
4	130	170
5	150	200
6	165	225

Answer: B

2. Which of the following occur when a person maximizes utility?
   I. the marginal utility of each good bought is equal
   II. the highest level of utility is attained
   III. all of a person's budget is spent

A) I and II.
B) I and III.
C) II and III.
D) I, II and III.

Answer: C

The ratio of MU to price is equal for all goods. OR, The ratio of MU is equal to relative price.

3. The supply of wheat decreases, so that the quantity of wheat consumed decreases. Thus
   A) both the marginal utility and the total utility from wheat increase.
   B) the marginal utility from wheat increases and the total utility decreases.
   C) the marginal utility from wheat decreases and the total utility increases.
   D) both the marginal utility and the total utility from wheat decrease.

Answer: B

4. A convex indifference curve diagram has movies on the vertical axis and sodas on the horizontal. As the consumption of sodas increases and movies decreases, the marginal rate of substitution of sodas
   A) rises.

B) falls.
C) does not change.
D) probably changes, but more information is needed to determine if it rises or falls.

Answer: B

$MRS_s = \frac{\Delta X_m}{\Delta X_s}$, i.e. for 1 more unit of soda, how many movies the consumer is willing to give up.

As the consumption of sodas increases and movies decreases, the extra units of soda are less and less valuable. Therefore, MRS falls.

5. In the above figure, which curve is an indifference curve for someone who views frozen pizzas and milk as perfect complement?

Answer: D

4 special cases of indifference curves:

(1) **Perfect substitutes**: $U = X_a + X_b$. i.e. the curve has a slope of -1. Example: Coke and Pepsi.

(2) **Perfect complements**: $U = \min(X_a, X_b)$. i.e. the curve has a right angle. Example: Left shoe and right shoe.

(3) **Good / Bad**: $U = X_a - X_b$. i.e. the curve has a slope of 1. Example: Luxury goods and their counterfeits.

(4) **Irrelevant**: $U = X_b$. i.e. the curve is a horizontal line. Example: Air and water.

6. Suppose Sam plans to buy only popcorn and soda. He has $40 to spend per week. A change in which of the following variables will change Sam's budget line?
I. price of popcorn.
II. income.
III. preferences.
IV. utility.

A) II only.
B) I and II.
C) I, II and III.
D) III and IV.

Answer: B

Budget line $P_p X_p + P_s X_s = B$

where P_p and B is involved in I and II.

7. Morriss has an income of $100 per week. The price of dog food is $2 per can and the price of cat food is $2 per can. However, there is a volume discount for cat food: If he buys more than 25 cans per week, the price of an additional can is only $1. In the above figure, Morriss's budget line runs through points

x-axis: cat food, y-axis: dog food

Point A = (0, 50), Point B = (25, 25), Point F = (75, 0)

Answer: A, B, F

8. The figure above shows Ilene's budget line. The price of a can of cat food is $2. If the price of a can of cat food rises, her budget line will
A) rotate inward toward the origin.

B) rotate outward away from the origin.
C) shift leftward in a parallel manner.
D) shift rightward in a parallel manner.

x-axis: cat food, y-axis: dog food

Answer: A

9. In the above figure, point B
A) is superior to point A.
B) is inferior to point A.
C) is as good as point A.
D) could be superior to, inferior to, or as good as point A but there is no way of telling which.

Answer: B

A and B are on the same budget line, but B is on a lower utility curve.

Note: if A and B are not on the same budget line, we cannot compare them.

[10-11] Consider a consumer whose marginal utilities are given by

$MU_x(x,y) = \sqrt{\frac{y}{x}}$ and $MU_y(x,y) = \sqrt{\frac{x}{y}}$

10. What is the marginal rate of substitution of good x at $(x,y) = (25,25)$?

Answer: 1

11. Suppose that the current market prices are $P_x = 1$ and $P_y = 2$, respectively, and the consumer's income is $I = 30$. Also, suppose that the consumer currently consumers $(x,y) = (10,10)$. Which of the following statements is true?

A) The consumer could be better off by substituting some of his current consumption of good x with good y.
B) The consumer could be better off by substituting some of his current consumption of good y with good x.
C) The marginal rate of substitution of good x is (approximately) 5 at $(x,y) = (10,10)$.
D) The marginal utility per dollar spent on good x is equal to the marginal utility per dollar spent on good y at $(x,y) = (10,10)$.

Answer: B

Relative price = Slope of budget line = $\frac{P_x}{P_y} = \frac{1}{2}$

MRS = $\frac{MU_x}{MU_y} = \frac{\sqrt{\frac{y}{x}}}{\sqrt{\frac{x}{y}}} = \frac{y}{x} = 1$

Since $MRS_x > \frac{P_x}{P_y}$, which means $\frac{MU_x}{P_x} > \frac{MU_y}{P_y}$, the marginal utility per dollar spent on good x is higher than that of good y. Therefore, the consumer could be better off by substituting some of his current consumption of good y with good x.

Further questions:

1. If the consumption bundle is $(x,y) = (15,7.5)$, is it consumer equilibrium?
2. If the consumption bundle is $(x,y) = (30,15)$, is it consumer equilibrium?

(1) Yes.

MRS = $\frac{7.5}{15} = 0.5$, which is equal to the relative price $\frac{P_x}{P_y} = \frac{1}{2}$.

(2) No.

This bundle violates the budget constraint $P_x x + P_y y = I$, where $I = 30$.

5. Theory of Producer

L	TP
0	0
1	4
2	10
3	18
4	25
5	30

1. The above table shows the total product of producing baseball hats. The marginal product of the 4th worker is equal to

Answer: 7

2. The above table shows the total product of producing baseball hats. The average product of the 3 workers is equal to

Answer: 6

L	TP
0	0
1	10
2	24
3	40
4	58
5	73
6	83

3. The above table shows the short-run total product schedule for the campus book store. When the fifth employee is hired, the

A) marginal product is increasing and is greater than average product.
B) marginal product is increasing and is less than average product.
C) marginal product is decreasing and is greater than average product.
D) marginal product is decreasing and is less than average product.

Answer: C

At $L = 4$, $MP = \frac{58-40}{4-3} = 18$, $AP = \frac{58}{4} = 14.5$

At $L = 5$, $MP = \frac{73-58}{5-4} = 15$, $AP = \frac{73}{5} = 14.6$

We can conclude that MP is decreasing and is greater than AP.

4. Which of the following statements is true for any marginal and average?
   A) When the marginal is greater than the average, the average rises.
   B) When the marginal is less than the average, the average rises.
   C) When the marginal is rising, the average is rising.
   D) When the marginal is equal to the average, the average falls.

Answer: A

C only holds for inverted U-shaped curve, e.g. AP.

For U-shaped curve, e.g. AVC, there is a range where the marginal cost is rising but the average cost is falling.

5. A technological change that increases productivity shifts the total product curve upward
   A) and also shifts the average product curve upward, but leaves the marginal product curve unchanged.
   B) but leaves the average product curve and the marginal product curve unchanged.
   C) and also shifts the marginal product curve upward, but leaves the average product curve unchanged.
   D) as well as the average product curve and the marginal product curves upward.

Answer: D

$$TP = A_t \cdot f(L, K)$$

When technology improves, A_t increases,

- $AP = \frac{TP}{L} = \frac{A_t \cdot f(L,K)}{L} = A_t \cdot \frac{f(L,K)}{L}$ increases
- $MP = \frac{\Delta TP}{\Delta L} = \frac{\Delta(A_t \cdot f(L,K))}{\Delta L} = A_t \cdot \frac{\Delta f(L,K)}{\Delta L}$ increases

6. Which of the following statements is true?
   A) The marginal and average product curves intersect at the maximum level of output.
   B) At every output level the marginal product curve lies above the average product curve.
   C) The marginal product and average product curves intersect when average product is at its maximum.
   D) The marginal product curve always has a positive slope.

Answer: C

7. Diminishing marginal returns to labor occur because
   A) after awhile it is hard to find a good worker.
   B) the capital resources used by the firm are fixed in the short run.
   C) workers become more efficient over time.
   D) larger companies are less efficient.

Answer: B

Due to the fixed capital, the marginal product of labor will decrease as more labor is employed.

8. If the price of labor increases and we are looking at a graph with capital on the vertical axis and labor on the horizontal, the
   A) isocost line will become steeper.
   B) isoquants will become steeper.

C) isoquants will become flatter.
D) isocost line will become flatter.

Answer: A

$rK + wL = C \Rightarrow K = -\frac{w}{r}L + \frac{C}{r}$

As w increases, $\left| -\frac{w}{r} \right|$ increases, so the isocost line becomes steeper.

9. For given input prices, isocost lines farther from the origin are associated with
A) lower costs.
B) the same costs.
C) higher costs.
D) initially lower then higher costs.

Answer: C

10. If the price of labor increases, in order to minimize the costs of producing a given level of output, the firm manager should use
A) less of labor and more of capital.
B) less of labor and less of capital.
C) more of labor and more of capital.
D) more of labor and less of capital.
E) the same amount of labor and capital.

Answer: A

[11-12] Consider an electric home appliance company whose marginal product of labor and marginal product of capital are respectively given by

$MP_L(L, K) = \frac{K}{L}$ and $MP_K(L, K) = \frac{L}{K}$

for any input choice where L and K are the total labor and capital employed. The current input prices are $w = 100$ and $r = 100$, respectively.

11. What is the marginal rate of technical substitution of labor at $(L, K) = (10, 50)$

Answer: 5

$MRTS = \frac{MP_L}{MP_K} = \frac{K}{L} = 5$

12. Suppose that the company currently hires $(L, K) = (10, 20)$ to produce 200 units of output. Which of the following statements is true?
A) The firm could lower its production cost by substituting a part of its current capital employment with labor.
B) The firm could lower its production cost by substituting a part of its current labor employment with capital.
C) The marginal rate of technical substitution is (approximately) 1 at $(L, K) = (10, 20)$.
D) None of above.

Answer: A

$MRTS = \frac{MP_L}{MP_K} = \frac{K}{L} = 2 > \frac{w}{r} = 1$

$\frac{MP_L}{w} > \frac{MP_K}{r}$, so employing more labor and less capital will lower the production cost.

6. Theory of Cost

1. In the short run,
   A) all resources are fixed.
   B) at least one resource is fixed.
   C) all resources are variable.
   D) there are no variable costs.

Answer: B

Short run: at least one resource is fixed.

Long run: all resources are variable.

2. The vertical distance between a firm's total cost (TC) and its total variable cost (TVC) curves
   A) decreases as output decreases.
   B) is equal to the average variable cost, AVC.
   C) is equal to the total fixed cost, TFC.
   D) is equal to the marginal cost, MC.

Answer: C

3. The above table gives some of the costs of the Delicious Pie Company. What is the total fixed cost of producing 100 pies?
   A) $300B)400$
   C) $700

Answer: A

4. As illustrated in the above figure, after 60 gallons are produced each hour at Ike's Ice Cream Kitchen, the ATC curve starts to slope upward. The ATC starts to slope upward when
   A) the MC curve slopes upward.
   B) the MC exceeds the ATC.
   C) the distance between the ATC and the AVC curve is shrinking.
   D) None of the above answers is correct.

Answer: B

5. In the above figure, the relationship between costs indicates that the distance between curves
   A) A and B is equal to the fixed cost.
   B) A and B is equal to the variable cost.
   C) B and C is equal to the fixed cost.
   D) B and C is equal to the average total cost.

Answer: A

6. A technological change that increases productivity will
   A) decrease marginal product and increase marginal cost.
   B) decrease both marginal product and marginal cost.
   C) increase both marginal product and marginal cost.
   D) increase marginal product but decrease marginal cost.

Answer: D

7. The long run
   A) means a long period of time, always longer than a year.

B) is a period of time in which all resources can be varied.
C) is different for different firms.
D) Both answers B and C are correct.

Answer: D

8. A firm is operating in its range of economies of scale and is on both its LRAC curve and its short-run ATC curve. At that level of output, the slope of its LRAC curve is
A) zero and the slope of its ATC curve is zero.
B) zero and the slope of its ATC curve is negative.
C) negative and the slope of its ATC curve is zero.
D) negative and the slope of its ATC curve is negative.

Answer: D

- **Economies of scale**: as output increases, the long-run average cost decreases.
- **Constant economies of scale**: as output increases, the long-run average cost remains constant.
- **Diseconomies of scale**: as output increases, the long-run average cost increases.
- **Increasing returns to scale**: as all inputs increase, output increases more than proportionally.
- **Constant returns to scale**: as all inputs increase, output increases proportionally.
- **Decreasing returns to scale**: as all inputs increase, output increases less than proportionally.

Therefore, LRAC curve exhibits a downward - flat - upward shape. (U-shaped but with the middle part flat)

The slope of LRAC in the range of economies of scale is negative. Since LRAC curve cotains all possible short-run ATC curves, and tangent to all of them at ATC's lowest point, the slope of ATC curve is also negative.

9. In the above figure, between 20 and 25 units per hour, the firm experiences
A) economies of scale.
B) diseconomies of scale.
C) constant returns to scale.
D) increasing total fixed costs.

Answer: B

10. Which of the following statements about average costs is incorrect?
A) The difference between average total cost and average variable cost does not change as output increases
B) Average variable cost first decreases and then increases as output increase
C) Average fixed cost decreases as output increases
D) Average total cost first decreases and then increases as output increases
E) The difference between average total cost and average variable cost is average fixed cost

Answer: A

$AFC = \frac{TFC}{Q}$, since TFC is fixed, AFC decreases as Q increases.

7. Perfect Competition

1. In a competitive industry, firm demand is
A. downward-sloping.

B. vertical.
C. nonexistent.
D. horizontal.
E. unchanging.

Answer: D

2. When firms enter an industry, market supply
   A. decreases and firm demand decreases.
   B. increases and firm demand does not change.
   C. decreases and firm supply decreases.
   D. increases and firm demand increases.
   E. increases and firm demand shifts down.

Answer: E

Market supply $\uparrow \Rightarrow$ equilibrium price $\downarrow \Rightarrow$ firm demand $\downarrow$

3. If, at the optimum level of output, a typical competitive firm's price is greater than its ATC, the firm
   A. should raise the price.
   B. should lower the price.
   C. should decrease output.
   D. will find that new firms are attracted to this industry.
   E. should increase output.

Answer: D

$\pi = (P - ATC) \cdot Q > 0$, making economic profit, new firms will enter the industry.

4. Suppose a dentist has total revenue of $320,000 and his total explicit costs are 250,000 for the year. Suppose the dentist left a job paying $112,000 a year to start his own practice. What is the dentist's economic profit? A. 182,000
   B. –$42,000 C. –28,000
   D. $112,000 E. 70,000

Answer: B

Total profit $\pi = TR - TC = 320,000 - 250,000 = 70,000$

Normal profit = 112,000

Economic profit = 70,000 - 112,000 = -42,000

7. A firm in a long-run equilibrium state
   A. produces at the minimum of average variable cost.
   B. produces at the minimum of marginal cost.
   C. enjoys economies of scale.
   D. makes no economic profit.
   E. None of the above.

Answer: D

8. Suppose a competitive industry is in long-run equilibrium. When demand increases, market price
   A. decreases in the short and long run.

B. rises in the short run and falls in the long run.
C. decreases in the short run and rises in the long run.
D. rises in the short and long run.
E. rises in the short run and rises more in the long run.

Answer: B

9. A technological breakthrough that reduces the cost of firms in a perfectly competitive canning industry would, in the long run,

A. lead to higher profits.
B. raise prices.
C. lower the output produced by each firm.
D. increase the number of producers.
E. decrease the number of producers.

Answer: D

8. Perfect Competition and Allocative Efficiency

2. In the table above, if there are 80 umbrellas produced, the deadweight loss from the 80th umbrella is
A. $10.$ $B.$ 20.
C. $30.$ $D.$ 40.

P	Q_D	Q_S
0	90	0
10	80	0
20	40	40
30	20	80
40	0	120

Answer: B

At $Q_D = 80$, $P = 10$

At $Q_S = 80$, $P = 30$

9. Monopoly

5. Given that

- Price = $P = 500 - Q$
- Marginal cost = $MC = 2Q$
- Total fixed cost = $TFC = 10000$

(1) Derive MR and ATC.

MR = $\frac{\Delta TR}{\Delta Q} = \frac{\Delta(P \cdot Q)}{\Delta Q} = \frac{\Delta(500Q - Q^2)}{\Delta Q} = 500 - 2Q$

TVC = $\frac{1}{2}(MC) \cdot Q = Q^2$

TC = TVC + TFC = $Q^2 + 10000$

ATC = $\frac{TC}{Q} = Q + \frac{10000}{Q}$

(2) The profit-maximizing quantity is

Let $MR = 500 - 2Q = MC = 2Q$, we get $Q = 125$

The profit-maximizing price is $P = 500 - 125 = 375$

(3) The maximum profit is

$(P - ATC) \cdot Q = (375 - (125 + \frac{10000}{125})) \cdot 125 = 21250$

10. Monopolistic Competition

1. Firms in monopolistic competition make products that are
   A) perfect complements.
   B) close but not perfect complements.
   C) perfect substitutes.
   D) close but not perfect substitutes.

Answer: D

2. When firms in monopolistic competition incur an economic loss, some firms will
   A) enter the industry and produce more products.
   B) exit the industry, and demand curves will shift to the right for the firms that remain.
   C) exit the industry, and demand curves will shift to the left for the firms that remain.
   D) enter the industry, and demand will become more elastic for the original firms.

Answer: B

3. In long-run equilibrium, a firm in monopolistic competition earns
   A) an economic profit but the economic profit is less than it would be if the firm was a monopoly.
   B) an economic profit that is higher than what it would be if the firm was a monopoly.
   C) a zero economic profit
   D) an economic profit that is the same amount as it would be if the firm was a monopoly.

Answer: C

11. Oligopoly

1. Which of the following is NOT true of Nash equilibrium in a game involving players A and B?
   A) Given the strategies of B, player A has chosen the highest payoff strategy.
   B) Neither player A or B wants to choose a different strategy.
   C) Both players will not change their choices.
   D) Both players must have dominant strategies.
   E) Given the strategies of A, player B has chosen the highest payoff strategy.

Answer: D

A dominant strategy equilibrium must be a Nash equilibrium, but a Nash equilibrium does not necessarily have to be a dominant strategy equilibrium.

Final Exam 2021B

1. In a perfectly competitive market, the market demand function is $Q_d = 10 - 2P$, the market supply function is $Q_s = 3P - 10$.

(a) What is the equilibrium price and quantity?

$Q_d = Q_s \Rightarrow 10 - 2P = 3P - 10 \Rightarrow P = 4, Q = 2$

(b) What is the consumer surplus and producer surplus at the equilibrium?

$CS = \frac{1}{2} \cdot (5 - 4) \cdot 2 = 1$

$PS = \frac{1}{2} \cdot (4 - \frac{10}{3}) \cdot 2 = \frac{2}{3}$

(c) Suppose the government sets a price floor at $P = 4.5$. What is the new equilibrium quantity?

$P > P^* \Rightarrow Q_d < Q_s \Rightarrow Q = Q_d = 10 - 2 \cdot 4.5 = 1$

(d) What is the deadweight loss from the price floor?

$CS' = \frac{1}{2} \cdot (5 - 4.5) \cdot 1 = 0.25$

$PS' = \frac{1}{2} \cdot (4.5 - \frac{10}{3}) \cdot 1 = \frac{7}{12}$

$SW' = CS' + PS' = 0.25 + \frac{7}{12} = \frac{5}{6}$

$SW = CS + PS = 1 + \frac{2}{3} = \frac{5}{3}$

$DWL = SW - SW' = \frac{5}{3} - \frac{5}{6} = \frac{5}{6}$

(e) Suppose the market is monopolized by a single firm. What is the equilibrium price and quantity?

$Q_d = 10 - 2P \Rightarrow P = 5 - \frac{Q}{2}$

$Q_s = 3P - 10 \Rightarrow P = \frac{Q+10}{3}$

$TR = P \times Q_d = (5 - \frac{Q}{2}) \times Q = 5Q - \frac{Q^2}{2}$

$MR = \frac{\Delta TR}{\Delta Q} = 5 - Q$

$MC = P = \frac{Q+10}{3}$

$MR = MC \Rightarrow 5 - Q = \frac{Q+10}{3} \Rightarrow Q = 1.25$

$P = 5 - \frac{1.25}{2} = 4.375$

(f) Can the government use price control to help the market reach an efficient outcome? (Assume that the monopolist earns positive profit when market efficient quantity is produced)

Yes. To achieve the efficient outcome, the government can set a price ceiling at $P = MC = \frac{Q+10}{3} = 3.75$.

(g) What is the consumer surplus and producer surplus under perfect discrimination?

$CS = 0$

$PS = \frac{1}{2}[(5 - \frac{10}{3}) + (4.375 - 3.75)] \times 1.25 = 1.43$

2. In a monopolistic competitive market, the demand faced by firm A is $P = 1000 - 3Q$

Firm A has $MC = 4Q$ and $ATC = \frac{40000}{Q} + 4Q$

(a) Short-run economic profit

$TR = P \times Q = (1000 - 3Q) \times Q = 1000Q - 3Q^2$

$MR = \frac{\Delta TR}{\Delta Q} = 1000 - 6Q$

$MR = MC \Rightarrow 1000 - 6Q = 4Q \Rightarrow Q = 100$

$ATC = \frac{40000}{100} + 4 \times 100 = 800$

$P = 1000 - 3 \times 100 = 700$

$\pi = (P - ATC) \times Q = (700 - 800) \times 100 = -10000$

(b) Your student comments that in the long run firm A will earn zero economics profit, and therefore there is no deadweight loss in this market. Do you agree? Explain briefly in terms of the concept of Pareto efficiency.

In a monopolistically competitive market, it's true that in the long run, firms tend to earn zero economic profit due to the entry of new firms attracted by any short-term profits. This process continues until the firm's demand curve is just tangent to its average total cost curve, indicating that the firm is earning normal profits.

However, the assertion that there is no deadweight loss in this market is not accurate. Monopolistically competitive markets are characterized by firms producing below their minimum efficient scale, leading to excess capacity and higher average total costs than necessary. Moreover, because firms have some degree of market power and can set prices above marginal costs, the price paid by consumers is higher than the marginal cost of production, which leads to allocative inefficiency.

Pareto efficiency, on the other hand, is a state where resources cannot be reallocated to make one individual better off without making at least one individual worse off. In the context of monopolistic competition, the market does not achieve Pareto efficiency because the price set by firms is above the marginal cost, which means that consumers are paying more than the cost of the last unit produced, and not all mutually beneficial trades are being made. This results in a deadweight loss, as there are potential gains from trade that are not being realized.

(c) Now, the market for good X is changed into an oligopoly market. And good X is produced by firm A and B, which face a demand function $P = 1000 - 5Q$.

Firm A has $MC = 4Q$ and $ATC = \frac{400}{Q} + 4Q$

Firm B has $MC = 6Q$ and $ATC = \frac{600}{Q} + 6Q$

Find the market supply curve.

$MC = MC_A + MC_B = 4Q + 6Q = 10Q$

(d) If A and B form a cartel, what is the equilibrium price and quantity?

$TR = P \times Q = (1000 - 5Q) \times Q = 1000Q - 5Q^2$

$MR = \frac{\Delta TR}{\Delta Q} = 1000 - 10Q$

$MC = MR \Rightarrow 1000 - 10Q = 10Q \Rightarrow Q = 50$

$P = 1000 - 5 \times 50 = 750$

(e) Find the output and profit of each firm in the cartel.

The cartel equilibrium quantity is produced when both firms have the same marginal cost.

Denote the output of firm A as Q_A and the output of firm B as Q_B.

$MC_A = 4Q_A = MC_B = 6Q_B$

$Q_A + Q_B = 50$

$Q_A = 30, Q_B = 20$

$ATC_A = \frac{400}{30} + 4 \times 30 = \frac{400}{3}$

$ATC_B = \frac{600}{20} + 6 \times 20 = 150$

$\pi_A = (P - ATC_A) \times Q_A = (750 - \frac{400}{3}) \times 30 = 18500$

$\pi_B = (P - ATC_B) \times Q_B = (750 - 150) \times 20 = 12000$

3. Given a perfectly competitive market, where the market demand is given by $Q_d = 150 - 2P$ and the market supply is given by $Q_s = 2P - 50$.

(a) Equilibrium price and quantity

$Q_d = Q_s \Rightarrow 150 - 2P = 2P - 50 \Rightarrow P = 50$

$Q = 150 - 2 \times 50 = 50$

(b) Consumer and producer surplus

$CS = \frac{1}{2} \times (75 - 50) \times 50 = 625$

$PS = \frac{1}{2} \times (50 - 25) \times 50 = 625$

(c) Suppose a price floor of $60 is imposed. New equilibrium quantity

$P > P^* \Rightarrow Q_d < Q_s \Rightarrow Q = Q_d = 150 - 2 \times 60 = 30$

(d) Deadweight loss

$CS' = \frac{1}{2} \times (75 - 60) \times 30 = 225$

$PS' = \frac{1}{2} \times (60 - 25) \times 30 = 525$

$SW' = CS' + PS' = 750$

$SW = CS + PS = 1250$

$DWL = SW - SW' = 500$

(e) Suppose the market is monopolized. New equilibrium price and quantity

$Q_d = 150 - 2P \Rightarrow P = 75 - \frac{Q}{2}$

$Q_s = 2P - 50 \Rightarrow P = \frac{Q}{2} + 25$

$TR = Q_d \times P = Q \times (75 - \frac{Q}{2}) = 75Q - \frac{Q^2}{2}$

$MR = \frac{dTR}{dQ} = 75 - Q$

$MC = P = \frac{Q}{2} + 25$

$MR = MC \Rightarrow 75 - Q = \frac{Q}{2} + 25 \Rightarrow Q = \frac{100}{3} \approx 33.33$

$P = 75 - \frac{Q}{2} = 75 - \frac{100}{6} = 58.33$

(f) Consumer surplus and producer surplus under perfect discrimination

$CS = 0$

$PS = \frac{1}{2}[(75-25) + (\frac{175}{3} - \frac{125}{3})] \times \frac{100}{3} = \frac{10000}{9} \approx 1111.11$

EC110 Sample Final Exam

56. $Q_d = 530 - 12P, Q_s = -150 + 8P$

(a) Equilibrium price and quantity

$Q_d = Q_s \Rightarrow 530 - 12P = -150 + 8P \Rightarrow P = 34, Q = 530 - 12 \times 34 = 122$

(b) Price elasticity of demand at $P = 25$

$\varepsilon = \frac{\Delta Q_d / Q_d}{\Delta P / P} = \frac{-12\Delta P}{230} \div \frac{\Delta P}{25} = -\frac{30}{23} \approx -1.304$

(c) The total revenue change when price is decreased to $P = 25$

Since $|\varepsilon| > 1$, the demand is elastic. The total revenue will increase.

$TR_1 = P_1 \times Q_1 = 34 \times 122 = 4148$

$TR_2 = P_2 \times Q_2 = 25 \times (530 - 12 \times 25) = 5750$

57.

A \ B	400	300
400	20, 20	10, 60
300	60, 10	15, 15

(a) The dominant strategy for A and B

For A, choosing 300 gives strictly higher payoff than choosing 400, so the dominant strategy for A is 300. Same for B.

(b) The Nash equilibrium

Since the dominant strategy equilibrium is a subset of Nash equilibrium, the Nash equilibrium is (300, 300).

(c) What can be done to make the outcome more efficient? Be
sure to note any problems that might arise if they resort to this option.

A and B can cooperate as a cartel. This allows oligopolists to act as a monopoly and maximize joint profits. This is a more efficient outcome than the Nash equilibrium.

Problems that might arise include: incentive to cheat, potential for collusion to break down, and new firms entering the market.

59.

Labor	Output	TFC	TVC	TC
0	0	150		
1	20		150	
2	32			
3	40			

Labor	Output	TFC	TVC	TC
4	45			

(a) Complete the table

Labor	Output	TFC	TVC	TC
0	0	150	0	150
1	20	150	150	300
2	32	150	300	450
3	40	150	450	600
4	45	150	600	750

(b) At $Q = 40$, calculate ATC, AVC, and MC

$ATC = \frac{TC}{Q} = \frac{600}{40} = 15$

$AVC = \frac{TVC}{Q} = \frac{450}{40} = 11.25$

$MC = \frac{\Delta TC}{\Delta Q} = \frac{600-450}{40-32} = 18.75$

(c) Now, assume that the bike shop operates in a perfectly competitive market and the market price is $30.00. Based upon
this information, determine the profit maximizing output, as well as the profit at that output level. Given this result,
what should you expect to happen in the bike shop market.

At $Q = 45$, $MC = 30$, so the profit-maximizing output is 45.

$ATC = \frac{750}{45} = 16.67$

$\pi = (P - ATC) \times Q = (30 - 16.67) \times 45 = 600$

The bike shop is making an economic profit, so we should expect new firms to enter the market.