Microeconomics I

Licenciatura in Economics

4th of February of 2022
Duration: 2 hours

Repeat-Period Exam

Multiple-Choice Question

Full Name: …… a

Student Number: …… Class: ……

1. Mark your answers with an 'O' in the table below. You get 0.5 marks for each right answer, and a 0.5/3 (≈ 0.167) deduction for any wrong answer.
2. This is a closed-bool exam: you cannot look up books or notes of any kind. Invigilators will not help you with the exam.
3. Switch off and put away any mobile phones, computers, and any other data storage device.
4. This exam paper must be returned to the invigilator even if you decide to quit.

ANSWER TABLE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b
c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d

1. Well-behaved preferences are defined as being:
   a) Transitive and convex.
   b) Complete, reflexive, and transitive.
   c) Complete, transitive, and convex.
   d) Monotonic and convex.

2. The utility function $u(x, y) = (x + 2y)^3$ describes:
   a) Perfect substitutes.
   b) Perfect complements.
   c) Quasi-linear preferences.
   d) None of the other options are correct.

3. Utility is given by $u(x, y) = x^3 + y^2$. The marginal rate of substitution (quantity of y per unit of x) at bundle (2, 5) is:
   a) -2/3.
   b) -1.2.
   c) -1.5.
   d) -2.5.

4. Ed was consuming bundle $(x, y) = (5, 7)$. Then his budget line shifted out in a parallel fashion, and he switched to bundle (8, 6). This means:
   a) *X* and *Y* are normal goods.
   b) *X* is a normal good; *Y* an inferior good.
   c) *X* is an ordinary good; *Y* a Giffen good.
   d) *X* and *Y* are ordinary goods.

5. Ed has strictly convex preferences. His budget line crosses a certain indifference curve at bundles *A* and *B*. Then:
   a) His optimal bundle is one of the extremes of his budget line (either $x = 0$ or $y = 0$).
   b) His optimal bundle could be anywhere on his budget line.
   c) Both *A* and *B* are optimal bundles.
   d) None of the other options are correct.

6. An ordinary good is necessarily:
   a) A normal good.
   b) An inferior good.
   c) A Giffen good.
   d) None of the other options are correct.

7. Ed can lend or borrow any amount at interest rate r. Then his intertemporal budget line over periods 1 and 2 is:
   a) $c_2 = m_2 + (1 + r)(c_1 - m_1)$.
   b) $c_2 = m_2 + (1 + r)(m_1 - c_1)$.
   c) $c_1 = m_1 + (1 + r)(c_2 - m_2)$.
   d) None of the other options are correct.

8. Ed is a net seller of good 1. Then the price of good 1 rises. Then:
   a) He will remain a net seller of good 1 and will be better off.
   b) He may remain a net seller or switch to net buyer of good 1; he will be better off in either case.
   c) He will switch to net buyer of good 1 and will be better off.
   d) He may remain a net seller of good 1, in which case he will be worse off; or may switch to net buyer, in which case he may be worse off or better off.

9. The demand curve is $y = 30 - 2p$. For $p = 5$, the price-elasticity of demand is:
   a) -0.5.
   b) -1.5.
   c) -2.
   d) None of the other options are correct.

10. The law of diminishing marginal product means that:
    a) When the quantities of all inputs are simultaneously multiplied by $t > 0$, output multiplies by less than t.
    b) When the quantity of an input increases, output falls.
    c) As the quantities all inputs are simultaneously increased, marginal product falls.
    d) None of the other options are correct.

11. With the current production plan a firm has a profit of €30. The firm has constant returns to scale. If it doubles the inputs used (with all prices constant), profit will:
    a) Double.
    b) Increase, but less than double.
    c) Remain constant.
    d) None of the other options are correct.

12. The long-run marginal cost curve is:
    a) Steeper than the short-run one.
    b) Less steep than the short-run one.
    c) Approximately horizontal.
    d) None of the other options are correct.

13. A firm has the cost function $c(y) = 10y + A + B$ if $y > 0$ and $c(y) = A$ if $y = 0$, with constants $A, B > 0$. Then:
    a) *A* and *B* are fixed costs.
    b) *A* is a fixed cost, *B* a quasi-fixed cost.
    c) *A* is a quasi-fixed cost, *B* a fixed cost.
    d) None of the other options are correct.

14. The variable cost equals the area:
    a) Underneath the marginal cost curve.
    b) Underneath the average variable cost curve.
    c) Between the average variable cost and average (total) cost curves.
    d) None of the other options are correct.

15. In the short-run a price-taking firm will produce (> 0) only if the price is at least equal to:
    a) The minimum average variable cost.
    b) The minimum average (total) cost.
    c) The minimum marginal cost.
    d) None of the other options are correct.

16. The long-run conditional factor demand functions give:
    a) The profit-maximising input levels as a function of output and input prices.
    b) The cost-minimising input levels as a function of output level and input prices.
    c) The output-maximising input levels as a function of input prices and money available to spend on inputs.
    d) None of the other options are correct.

Regular-Period Exam

Open Questions

5. You cannot look up books or notes of any kind. Invigilators will not help you with the test.
6. Switch off and put away any graphical calculators, computers, mobile phones, or any other data storage device.

a) [1.5 mark] Ed consumes exactly 2 units of good *X* for every unit of good *Y*. He has income $m = 140$, and prices are $p_x = 3$ and $p_y = 4$. Find the optimal consumption bundle and illustrate Ed's choice (indifference curve and budget line) in a graph. Show all relevant calculations and explain your reasoning.

b) [2 marks] Ana's utility function is $u(x, y) = xy$, and her demand functions are $x(m, p_x) = 0.5m/p_x$ and $y(m, p_y) = 0.5m/p_y$. Her income is $m = 60$, and prices were initially $p_x = 2$ and $p_y = 5$. Then the price of good *X* increases to $p_x' = 3$. Find the equivalent variation and explain what it means.

c) [1.5 marks] At prices $p_x = 4$ and $p_y = 2$, Mark buys bundle $A = (10, 15)$; at prices $p_x' = 6$ and $p_y' = 2$, he buys bundle $B = (5, 23)$. Is any of these bundles revealed preferred to the other? Do Mark's choices conform to the weak axiom of revealed preference? Explain.

d) [1.5 marks] Eve's demand for good *X* is $x(p_x, m) = 0.2m - 5p_x$ for the relevant price and income ranges. She has income $m = 100$, and initially $p_x = 2$. Then the price rises to $p_x' = 3$. Find the substitution and income effects. Explain what they mean and show all relevant calculations.

e) [1.5 marks] A firm buys an input at €20 per unit, the only variable input, to produce an output that it sells at €6 per unit. With the present production plan, the marginal product of this input is 4. Could this production plan maximise profit, or would it be possible for the firm to increase profit by using more or less of the input? Explain.

f) [1 mark] A firm is considering using the input combination ($x_1 = 8$, $x_2 = 15$) to produce $y = 30$. At this input combination the marginal products are $MP_1 = 6$ and $MP_2 = 9$. Input prices are $w_1 = 10$, $w_2 = 20$. The technology is strictly convex. Show this situation in a graph, including the relevant isoquant and isocost line, and explain whether this is the optimal input combination to produce $y = 30$. If not, should the firm use more input 1 or more input 2? Explain.

g) [1.5 marks] A firm's production function is $y = f(x_1, x_2) = x_1^{0.5} + x_2^{0.5}$. The input prices are $w_1 = 4$ and $w_2 = 2$. Find the optimal input quantities to produce $y = 6$. What is the cost of $y = 6$? Explain your reasoning and show all relevant calculations.

h) [1.5 marks] A firm operates with the cost function:

$$c(y) = \begin{cases} 4y^2 + 100 & \text{if} \quad y > 0 \\ 0 & \text{if} \quad y = 0 \end{cases}$$

Find the supply curve and illustrate it in a graph. Explain your reasoning and show all relevant calculations.

Answers to the multiple-choice question

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
d	a	b	b	d	d	b	a	a	d	a	b	b	a	a	b

Answers topics to the open question

a) Ed consumes 2 units of X per unit of Y, so $x = 2y$ (the goods are perfect complements). Substituting this into the budget line: $3x + 4y = 140 \Leftrightarrow 3(2y) + 4y = 140 \Leftrightarrow y = 14$, so $x = 28$. See Varian, chap. 5 for the graphical illustration.

b) With the new price $p_x' = 3$, Ana will buy $x(60, 3) = 10$ and $y(60, 5) = 6$, obtaining utility $u(10, 6) = 60$ (it is a coincidence that income is €60). Income m' she would need to obtain the same utility with the old price $p_x = 2$: $u[x(m', 2), y(m', 5)] = u(10, 6) \Leftrightarrow u(0.5m'/2, 0.5m'/5) = 60 \Leftrightarrow m' = 48.99$. So with $m' = 48.99$ and $p_x = 2$ she gets the same utility as with her actual income $m = 60$ and $p_x' = 3$. This means she would be willing to lose 60 – 48.99 = 11.01 of her income to avoid the price increase. This 11-01 is the equivalent variation.

c) When Mark buys bundle A his income is (we assume he spends all his income) 4 x 10 + 2 x 15 = 70. At those prices bundle B would cost 4 x 5 + 2 x 23 = 66; so it was affordable. So Mark chose A when B was affordable, meaning A is revealed preferred to B. When he bought B his income was 76, and at those prices A would cost 90, so it was not affordable, meaning B is not revealed preferred to A. So his choices conform to the weak axiom of revealed preference: they would not if each of the bundles were revealed preferred to the other.

d) At initial price Eve buys $x(2, 100) = 10$. Then p_x increases by €1, so she would need an extra €10 to keep buying the same bundle as before. With that extra income, so $m' = 110$, and the new price she would buy $x(3, 110) = 7$. So with the higher price and adjusted nominal income to keep her purchasing power constant, consumption of X would fall by 3; this is the substitution effect. With her actual income (100) and the new price she buys $x(3, 100) = 5$, 2 less than with constant purchasing power; so -2 is the income effect.

e) By using 1 more unit of the input, output increases by 4, so revenue increases by €6 x 4 = €24; but cost increases only by €20, so profit goes up.

f) The technical rate of substitution is $TRS = -MP_1/MP_2 = -6/9 = -2/3$. This means that if we use 1 more unit of input 1, we can reduce input 2 by 2/3 while keeping output constant. In so doing cost will fall: we spend €10 on the extra unit of input 1 , but save 2/3 x €20 = €13.33 on input 2. So it is possible to reduce the cost. Graphically, the $TRS = -2/3$ is the slope of the isoquant. The isocost line is $w_1x_1 + w_2x_2 = C \Leftrightarrow x_2 = C/w_2 - (w_1/w_1)x_1$, so its slope is $-w_1/w_1 = -0.5$. So at input combination (8, 15) the isoquant is steeper than the isocost line: moving down along the the isoquant (more input 1, less input 2) we move to input combinations underneath the isocost line trough (8, 15), meaning a lower cost.

g) $TRS = -MP_1/MP_2 = -(x_2/x_1)^{0.5}$. From cost-minimisation conditions $TRS = -w_1/w_2 \Leftrightarrow -(x_2/x_1)^{0.5} = -4/2$ and the technological constraint $f(x_1, x_2) = 6$ we get $x_1 = 4$ and $x_2 = 6$. So cost is 4 x 4 + 2 x 16 = 48.

h) Quantity supplied is zero if the price is less than the minimum average cost. $AC = 4y + 100/y$, which is minimised with $y = 5$, so $\min AC = AC(5) = 40$. If the price is at least 40, profit is maximised with $MC = p \Leftrightarrow y = p/8$. So the supply curve is:

$$y^s(p) = \begin{cases} p/8 & \text{if } p \geq 40 \\ 0 & \text{if } p < 40 \end{cases}$$