uc3m – Final Exam in Microeconomics: Multiple Choice – May 12, 2026

Name: Reduced Group:

You have 45 minutes to answer the following 15 questions. Exactly one of the statements is correct in each question. You receive 2 points for each correct answer, -0.66 points for each incorrect answer, and 0 points for each unanswered question.

Question 1: Pareto preferences violate which of the following axioms:

☐ Monotonicity.
☐ Transitivity.
☒ Completeness.
☐ None of the other answers is correct.

Question 2: Identify the optimal bundle at prices $p_x = 11$ and $p_y = 5$ of a consumer with utility function $u(x, y) = x + 3y$, whose income is $I = 110$.

☒ $(0, 22)$ ☐ $(10, 0)$ ☐ $(5, 5)$ ☐ None of the other answers is correct.

Question 3: If a consumer's preferences $\succsim$ satisfy axioms A1, A2, and A3, and it is known that $A = (2, 5) \succ B = (3, 3)$, then the following relation between these bundles and bundle $C = (3, 2)$ can be inferred:

☐ $B \succ C$ ☐ $C \sim A$ ☒ $A \succ C$ ☐ None of the other answers is correct.

Question 4: If prices were $(p_x^0, p_y^0) = (3, 6)$ in the base period and are $(p_x^1, p_y^1) = (5, 5)$ in the current period, then the Laspeyres CPI of an individual whose consumption in the base period was $(x, y) = (5, 3)$ is:

☐ $\frac{14}{9}$ ☐ $\frac{9}{5}$ ☐ $\frac{5}{6}$ ☒ None of the other answers is correct.

Question 5: If the preferences of the consumer from Question 4 are represented by the utility function $u(x, y) = x + 2y$, then her true CPI is:

☐ $\frac{14}{9}$ ☐ $\frac{9}{5}$ ☒ $\frac{5}{6}$ ☐ None of the other answers is correct.

Question 6: The expected utility and risk premium of the lottery l that pays $x = (0, 16, 100)$ with probabilities $p = \left(\frac{1}{4}, \frac{1}{2}, \frac{1}{4}\right)$ for an individual whose preferences are represented by the Bernoulli utility function $u(x) = \sqrt{x}$ are:

☒ $Eu(l) = 4.5, PR(l) = 12.75$
☐ $Eu(l) = 7, PR(l) = 10$
☐ $Eu(l) = 4.5, PR(l) = 14.25$
☐ None of the other answers is correct.

Question 7: Begoña, whose preferences are represented by the Bernoulli utility function $u(x) = \sqrt{x}$, receives a job offer with a wage that depends on the evolution of the economy: if the economy accelerates its growth (A), it pays $x_A = 16$; if it maintains its current growth (B), it pays $x_B = 9$; and if it enters a recession (C), it pays $x_C = 4$. The probabilities of scenarios A, B, and C are $p_A = \frac{1}{2}$, $p_B = \frac{1}{3}$, and $p_C = \frac{1}{6}$, respectively. If the company where Begoña currently works wanted to retain her, what is the minimum fixed wage x_F it would have to offer her?

☐ $x_F = 9$ ☐ $x_F = 8$ ☐ $x_F = 7$ ☒ None of the other answers is correct.

Questions 8 and 9: Elisa has a Bernoulli utility function given by $u(x) = x$. She faces a compound lottery l. With probability $\frac{3}{5}$, Elisa receives 100 euros for sure. With the remaining probability $\frac{2}{5}$, she participates in a second lottery that pays 25 euros with probability $\frac{7}{12}$, and 121 euros with probability $\frac{5}{12}$. What is her expected utility, $Eu(l)$?

☐ $Eu(l) = 72$ ☒ $Eu(l) = 86$
☐ $Eu(l) = 90$ ☐ None of the other answers is correct.

What is her risk premium for lottery l?

☐ $PR(l) = 11$ ☐ $PR(l) = 3$
☐ $PR(l) = 7$ ☒ None of the other answers is correct.

Question 10: *Swifties & Stylers* produces merchandise for famous musicians using labor L and capital K according to the production function $F(L, K) = (\sqrt{L} + 2\sqrt{K})^3$. Therefore, *Swifties & Stylers* has

☐ increasing marginal costs
☒ increasing returns to scale
☐ constant returns to scale
☐ None of the other answers is correct.

Question 11: A firm produces a good using labor L and capital K according to the production function $F(L, K) = \sqrt{2L + K}$. If the prices of labor and capital are $w = 7$ and $r = 4$, its conditional factor demands satisfy:

☒ $L(Q, w, r) = \frac{Q^2}{2}, K(Q, w, r) = 0$
☐ $L(Q, w, r) = Q^2, K(Q, w, r) = 2Q^2$
☐ $L(Q, w, r) = \frac{Q^2}{4}, K(Q, w, r) = \frac{Q^2}{2}$
☐ None of the other answers is correct.

Question 12: A firm produces a good using labor and capital according to the production function $F(L, K) = \min\{\sqrt{L}, 2K\}$. If the prices of labor and capital are $w = 2$ and $r = 4$, respectively, its cost functions for $q > 0$ satisfy:

☒ $MC(q) = 4q + 2$
☐ $C(q) = 4 + q^2$
☐ $AC(q) = 4 + 2q$
☐ None of the other answers is correct.

Questions 13 and 14: In a market, the only available production technology, which is not protected by a patent, allows firms to produce the good with costs $C(q) = 3q^3 - 12q^2 + 18q$. Market demand is $D(p) = \max\{66 - p, 0\}$. What is the price in the long-run competitive equilibrium with free entry and exit?

☐ 19 ☒ 6 ☐ 11 ☐ None of the other answers is correct.

How many firms are active in this equilibrium?

☒ 30 ☐ 23 ☐ 17 ☐ None of the other answers is correct.

Question 15: A monopoly produces a good at zero cost in a market in which demand is $D(p) = \max\{15 - p, 0\}$. The introduction of a price ceiling $\bar{p} = 8$ euros/unit implies:

☐ a decrease in the level of production
☐ an increase in consumer surplus
☐ a larger deadweight loss
☒ None of the other answers is correct.

uc3m – Final Exam in Microeconomics: Exercises – May 12, 2026

Name: Reduced Group:

Exercise 1 (35 points). The preferences of a consumer over food (x) and clothes (y) are represented by the utility function $u(x, y) = 2\ln x + y$.

A. (12 points) Calculate her ordinary demand functions for food and clothes, as well as the utility level she obtains, given prices and income, (p_x, p_y, I).

Solution: The budget line is $p_x x + p_y y = I$ (**1 point**). Since

$$MU_x = \frac{2}{x}, \quad MU_y = 1,$$

we have $MRS(x, y) = 2/x$ (**1 point**). In an interior solution,

$$\frac{2}{x} = \frac{p_x}{p_y}$$

(**1 point**), and hence

$$x(p_x, p_y, I) = \frac{2p_y}{p_x}$$

(**1.5 points**). Using the budget line,

$$y(p_x, p_y, I) = \frac{I - p_x x}{p_y} = \frac{I}{p_y} - 2$$

(**1.5 points**). This solution requires $I \geq 2p_y$ (**2 points**). Therefore, if $I \geq 2p_y$, the consumer's utility is (**1 point**)

$$u^{IS}(p_x, p_y, I) = 2\ln\left(\frac{2p_y}{p_x}\right) + \frac{I}{p_y} - 2.$$

If $I < 2p_y$, the solution is a corner solution. Then, if $I < 2p_y$, $x(p_x, p_y, I) = \frac{I}{p_x}$ and $y(p_x, p_y, I) = 0$ (**2 points**). Utility in this case is

$$u^{CS}(p_x, p_y, I) = 2\ln\left(\frac{I}{p_x}\right)$$

(**1 point**).

B. (15 points) Suppose that the consumer's income is $I = 25$ and prices are $(p_x, p_y) = (1, 2)$. Calculate the income and substitution effects on the demand for good x of the introduction of a consumption tax on x that increases its price to $p'_x = 2$.

Solution: Before the tax, $(p_x, p_y, I) = (1, 2, 25)$. Therefore (**2 points**),

$$x^* = 4, \quad y^* = \frac{21}{2}.$$

Utility before the tax is $u^* = 2\ln 4 + \frac{21}{2}$ (**2 points**). After the tax, $(p'_x, p_y, I) = (2, 2, 25)$. Then (**2 points**)

$$x^t = 2, \quad y^t = \frac{21}{2}.$$

Since preferences are quasi-linear and the solution is interior, compensated demand for good x does not depend on income. Therefore, to calculate the substitution effect, it is enough to calculate the demand for x at the new prices, implicitly keeping utility constant. The compensated tangency condition is

$$\frac{2}{\hat{x}} = \frac{p'_x}{p_y} = 1,$$

so that (**3 points**)

$$\hat{x} = 2.$$

The effects on the demand for x are then (**2 points each**)

$$SE = \hat{x} - x^* = 2 - 4 = -2,$$

$$IE = x^t - \hat{x} = 2 - 2 = 0,$$

and (**2 points**)

$$TE = x^t - x^* = -2.$$

C. (8 points) Calculate the true and Laspeyres price indices for this consumer with $I = 25$, taking $(1, 2)$ as the prices of the base period and $(2, 2)$ as the prices of the current period. Explain in no more than two sentences why they differ.

Solution: The optimal bundle in the base period is

$$(x^*, y^*) = \left(4, \frac{21}{2}\right),$$

and its cost at base-period prices is 25. The Laspeyres price index is therefore (**3 points**)

$$P^L = \frac{2 \cdot 4 + 2 \cdot \frac{21}{2}}{25} = \frac{29}{25} = 1.16.$$

To calculate the true price index, we need the minimum expenditure at current prices that allows the consumer to reach the initial utility level

$$u^* = 2 \ln 4 + \frac{21}{2}.$$

At current prices $(2, 2)$,

$$\hat{x} = 2.$$

To calculate $\hat{y}$, we impose that the consumer reaches the initial utility level (**2 points**):

$$2 \ln 2 + \hat{y} = 2 \ln 4 + \frac{21}{2}.$$

Therefore,

$$\hat{y} = \frac{21}{2} + 2 \ln 2.$$

The minimum expenditure at current prices is then (**1 point**)

$$2 \cdot 2 + 2\left(\frac{21}{2} + 2 \ln 2\right) = 25 + 4 \ln 2.$$

Thus, the true price index is (**1 point**)

$$P^V = \frac{25 + 4 \ln 2}{25} \approx 1.1109.$$

The indices differ because Laspeyres keeps the initial bundle fixed, while the true price index allows substitution from x to y when x becomes more expensive. For this reason, Laspeyres overestimates the increase in the cost of living (**1 point**).

Exercise 2 (35 points). Consider the market for a good whose demand is

$$D(p) = \max\{710 - p, 0\},$$

where 12 competitive firms currently operate, all producing the good with the same technology and total cost $C(q) = 180 + 10q + q^2$ for $q \geq 0$.

A. (12 points) Calculate the supply function of each firm (verify all the conditions that characterize the solution to the firm's problem) and the market supply.

Solution: Each firm maximizes (**1 point**)

$$\pi(q) = pq - 180 - 10q - q^2.$$

The FOC for an interior solution is (**2 points**)

$$p = MC(q) = 10 + 2q,$$

and the SOC holds because $\partial^2\pi(q)/\partial q^2 = -2 < 0$ (**1 point**). Therefore, the candidate quantity is (**2 points**)

$$q(p) = \frac{p - 10}{2}.$$

The firm produces only if $p \geq \min AVC(q)$. Since

$$AVC(q) = \frac{10q + q^2}{q} = 10 + q,$$

we have $\min AVC(q) = 10$ (**3 points**). Therefore, individual supply is (**2 points**)

$$s_i(p) = \begin{cases} \frac{p-10}{2} & \text{if } p \geq 10, \\ 0 & \text{if } p < 10. \end{cases}$$

Since there are 12 identical firms, market supply is (**1 point**)

$$S(p) = \begin{cases} 6(p - 10) & \text{if } p \geq 10, \\ 0 & \text{if } p < 10. \end{cases}$$

B. (5 points) Calculate the price, quantity, and consumer surplus in the competitive equilibrium.

Solution: In competitive equilibrium, $D(p) = S(p)$. Since the equilibrium price will be greater than 10, we use $S(p) = 6(p - 10)$:

$$710 - p = 6(p - 10)$$

(**2 points**). Therefore,

$$p^{CE} = 110$$

(**1 point**) and

$$q^{CE} = 710 - 110 = 600$$

(**1 point**). Consumer surplus is (**1 point**)

$$CS^{CE} = \frac{(710 - 110)600}{2} = 180000.$$

C. (13 points) Suppose now that the market is monopolized by a single firm that produces the good with the technology described by $C(q)$. Calculate the price, quantity, and deadweight loss in the monopoly equilibrium. Also calculate the Lerner index. What is the price elasticity of demand at the monopolist's optimum?

Solution: The inverse demand is $p(q) = 710 - q$, so $MR(q) = 710 - 2q$ (**2 points**). Moreover,

$$MC(q) = 10 + 2q$$

(**1 point**). The monopolist's FOC is (**2 points**)

$$710 - 2q = 10 + 2q.$$

Therefore,

$$q^M = 175$$

(**1 point**) and

$$p^M = 710 - 175 = 535$$

(**1 point**).
The efficient quantity satisfies $p(q) = MC(q)$, that is (**2 points**)

$$710 - q = 10 + 2q \quad \Longleftrightarrow \quad q^{EF} = \frac{700}{3}.$$

Deadweight loss is the area of the triangle between demand and marginal cost. Its base is

$$q^{EF} - q^M = \frac{700}{3} - 175 = \frac{175}{3},$$

and its height is

$$p(q^M) - MC(q^M) = 535 - 360 = 175.$$

Therefore (**2 points**),

$$DWL = \frac{1}{2} \cdot \frac{175}{3} \cdot 175 = \frac{30625}{6} \approx 5104.17.$$

The Lerner index is (**1 point**)

$$L = \frac{p^M - MC(q^M)}{p^M} = \frac{535 - 360}{535} = \frac{35}{107} = 0.3271.$$

The price elasticity of demand at the optimum is (**1 point**)

$$\varepsilon = -\frac{p^M}{q^M} = -\frac{535}{175} = -\frac{107}{35} = -3.057.$$

D. (5 points) Suppose that the monopoly can use first-degree price discrimination. Calculate the monopolist's optimal quantity and the resulting consumer surplus, producer surplus, and deadweight loss.

Solution: With first-degree price discrimination, the monopolist produces all units for which marginal willingness to pay is at least equal to marginal cost. Therefore (**1 point**),

$$710 - q = 10 + 2q \quad \iff \quad q^{PD1} = \frac{700}{3}.$$

Since the monopolist charges each consumer her maximum willingness to pay, consumer surplus is (**1 point**)

$$CS^{PD1} = 0.$$

Producer surplus is equal to the area between demand and marginal cost up to q^{PD1}. This is a triangle with base $700/3$ and height 700, so (**2 points**)

$$PS^{PD1} = \frac{1}{2} \cdot \frac{700}{3} \cdot 700 = \frac{245000}{3}.$$

If it is interpreted as profit net of the fixed cost, then 180 must be subtracted. Since the quantity produced is efficient, deadweight loss is (**1 point**)

$$DWL^{PD1} = 0.$$