Intermediate Micro Midterm 1 Review: True/False Questions

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Question 1

- **True/False:** A consumer with utility $u(x_1, x_2) = x_1^{\alpha} x_2^{\beta}$ has an MRS of:

$$|MRS_{12}| = \frac{\alpha x_2}{\beta x_1}$$

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- ☐ **True**

  This is always the MRS for Cobb-Douglas.

$$|MRS_{12}| = \frac{MU_1}{MU_2} = \frac{\alpha x_1^{\alpha-1} x_2^{\beta}}{\beta x_1^{\alpha} x_2^{\beta-1}} = \frac{\alpha}{\beta} x_1^{\cancel{\alpha}-1-\cancel{\alpha}} x_2^{\cancel{\beta}-\cancel{\beta}+1}$$

Question 2

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- ☐ **False**

  Demand should only be a function of prices and income, not the other good.

  The fact that it is not a function of p_1 does not invalidate it

Question 3

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This is a property of Cobb-Douglas utility.
If $u(x_1, x_2) = x_1^{\alpha} x_2^{\beta}$, then:

$$x_1^* = \frac{\alpha}{\alpha + \beta} \cdot \frac{M}{p_1}, \ x_2^* = \frac{\beta}{\alpha + \beta} \cdot \frac{M}{p_2}$$

Since $\alpha, \beta, p_1, p_2, M$ are all > 0, $x_1^*, x_2^* > 0$

Question 4

- **True/False:** A consumer is indifferent between 3 units of x_1 and 4 units of x_2 (and any mix of these bundles).

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- **False**

  It should be $4x_1 + 3x_2$

  Check: $u(3, 0) = 3 \times 3 + 4 \times 0 = 9$

  $u(0, 4) = 3 \times 0 + 4 \times 4 = 16$

Question 5

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$$A \succsim B, \; B \succsim C, \; C \succsim A$$

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- **False**

They could be indifferent between all:
$A \sim B \sim C$
($A \sim C$ means $A \succsim C$ and $C \succsim A$)

Question 6

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- **True**

  Share of income spent on each good remains constant with C-D. In this case, the split is: 2/3 on good 1 and 1/3 on good 2. New income is 40+20+15=75.

  Therefore: $p_1x_1 = \frac{2}{3} \times 75 = 50$ and $p_2x_2 = \frac{1}{3} \times 75 = 25$

Question 7

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  One goods needs to enter non-linearly and one enters linearly

  With QL, MRS should only depend on one good:

$$|MRS| = \frac{2x_1 x_2}{x_1^2 + 1}$$

Question 8

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  Counter-example: perfect substitutes with $|MRS| = \frac{p_1}{p_2}$. Then any point on the budget line is optimal

Question 9

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- ☐ **True**

  Factorize: $(x_1 + x_2)^2$. This is a monotonic transformation of the usual P.S. utility function

  Alternatively, check the MRS:

$$|MRS| = \frac{MU_1}{MU_2} = \frac{2x_1 + 2x_2}{2x_1 + 2x_2} = 1$$

Question 10

- **True/False:** A consumer likes to consume x_1 and x_2 only in proportions of 5 units of x_1 with every 2 units of x_2. A possible utility representation is:

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  In general, if you need α x_1 for every β x_2, then

$$u(x_1, x_2) = \min\left\{\frac{1}{\alpha}x_1, \frac{1}{\beta}x_2\right\}$$

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  Law of demand: if the price of a good increases, quantity demanded of that good decreases (all else equal). It's the opposite here:

$$\frac{\partial x_1(p, M)}{\partial p_1} = \frac{M}{p_2} > 0$$

Question 12

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  Complements: as p_2 increases, demand for x_1 decreases (and similarly for p_1 and x_2). For C-D, x_1 demand is independent of p_2.

  The goods are unrelated! (neither complements nor substitutes)

Question 13

- **True/False:** Two students A and B have to read textbook chapters for Economics (E) and Math (M) each day. They each allocate 10 hours per day to studying. A enjoys Math more than B and so can read Math chapters faster than B. The following could represent their daily (time) budget constraints:

$$A: \; 2M + 0.7E \leq 10$$

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$$B: \; 3M + E \leq 10$$

- ☐ **True**

Faster = less time to read = lower "price"
(these BCs are ok since we have $2<3$)

Question 14

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- **False**

  They could be indifferent, e.g. perfect complements

Question 15

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- ☐ **True**

  Opportunity cost is $\frac{p_1}{p_2}$, so this is just checking the tangency condition (which must hold at an interior). Income is irrelevant.

Question 16

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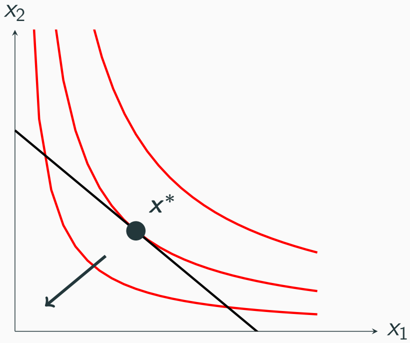
- **False**

They will always **spend** more on x_1 than on x_2. But if p_1 is large enough compared to p_2, they may consume a smaller **quantity**

Ex: $\alpha = 2, \beta = 1, p_1 = 10, p_2 = 1, M = 90$. Then $x_1^* = 6$, $x_2^* = 30$

Question 17

- **True/False:** x^* is the optimal bundle



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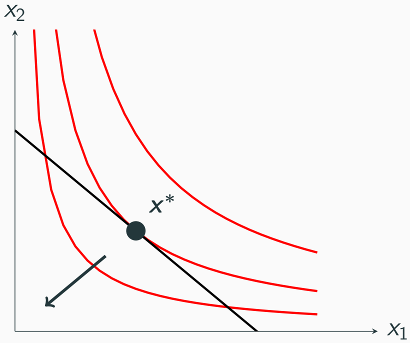

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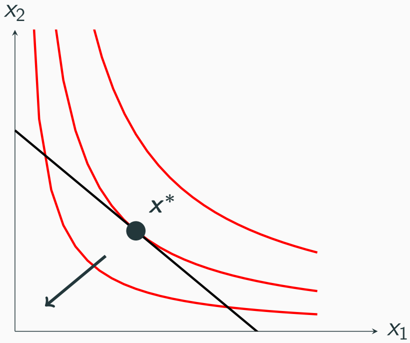

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  Look at the arrow's direction. Can achieve a higher utility inside the budget set!

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  This could possibly be an optimal bundle.

- ☐ **True**

  If we have a corner solution on the y-axis, then it must be that $|MRS| < \frac{p_1}{p_2}$.

  Therefore, this could be optimal (e.g. $u(x_1, x_2) = 2x_1 + x_2$ with $p_1 = 3, p_2 = 1$)

Question 19

- **True/False:** The following utility functions represent the same preferences:

$$u(x_1, x_2) = x_1^{0.5} x_2^{0.6}$$

$$v(x_1, x_2) = x_1^{\frac{1}{5}} x_2^{\frac{1}{6}}$$

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- **False**
  Turn to decimals: $v(x_1, x_2) = x_1^{0.2} x_2^{0.16}$. No monotonic transformation to get from $u()$ to $v()$. Alternatively: show that the MRS is different

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Check if second derivative of $x_2(x_1, u)$ is > 0:

$$x_2(x_1, u) = \left(u - x_1^{\frac{1}{2}}\right)^2 = u^2 - 2ux_1^{\frac{1}{2}} + x_1$$

$$\therefore \frac{\partial^2 x_2(x_1, u)}{\partial x_1^2} = \frac{\partial}{\partial x_1}\left[-ux_1^{-\frac{1}{2}} + 1\right] = \frac{1}{2}ux_1^{-\frac{3}{2}} > 0$$

Or check first derivative of MRS (not in absolute value): $\partial_{x_1} MRS = \partial_{x_1}\left[-\frac{x_2^{1/2}}{x_1^{1/2}}\right] = \frac{x_2^{1/2}}{2x_1^{3/2}} > 0$

Question 21

- **True/False:** The following do not represent the same preferences:

$$u(x_1, x_2) = x_1 + x_2$$
$$v(x_1, x_2) = \ln(x_1 + x_2)$$
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- ☐ **True**

  u and v are the same prefs, but w is not (no monotonic transformation to get from u to w). Also check the MRS: $|MRS^u| = |MRS^v| = 1$ (PS), $|MRS^w| = \frac{x_2}{x_1}$ (C-D)

Question 22

- **True/False:** A consumer has the following utility function

$$u(x_1, x_2) = x_1 x_2 - x_1$$

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$MU_1 = \frac{\partial u(x_1,x_2)}{\partial x_1} = x_2 - 1$

$MU_1 > 0$ as long as $x_2 > 1$

Question 23

- **True/False:** A consumer is indifferent between the bundles (6,2), (5,6), and (3,9). Assume they have complete, transitive, and monotonic preferences. It is possible for their preferences to also be convex.

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- **False**

  Consider this possible convex combination:

  $$0.5\times(6,2)+0.5\times(3,9)=(3+1.5,1+4.5)=(4.5,5.5)$$

  If convex, we should have $(4.5,5.5) \succsim (6,2)$
  By monotonicity: $(5,6) \succ (4.5,5.5)$
  By transitivity: $(6,2) \succ (4.5,5.5)$. Violates convexity!

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  Looking at the price ratio is not enough, we also need to look at the MRS, e.g. $p_1 = 2p_2$

$$u = x_1 + x_2 \implies |MRS| = 1 < 2 \implies x_1^* = 0$$

$$u = 3x_1 + x_2 \implies |MRS| = 3 > 2 \implies x_2^* = 0$$

Question 25

- **True/False:** Person A's utility from their optimal bundle is 12, while Person B's utility is only 4. They have the same preferences for goods x_1 and x_2, and face the same prices p_1 and p_2. We can therefore conclude that Person A has a higher income than Person B.

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- **False**

  Comparing utility levels is meaningless (unless we know they are the same function). The same preferences can be represented by many utility functions!

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- ☐ **(i) True, (ii) False**

Monotonicity implies that the MRS is negative
Convexity implies that the IC slope (MRS) is increasing in x_1. Here: $\frac{\partial MRS}{\partial x_1} = -\frac{2}{x_2} < 0$

E.g. Check with $u(x_1, x_2) = x_1^2 + 0.5x_2^2$

Question 27

- **True/False:** Two people A and B face the same prices and have the same income. Their utilities are:

$$u_A(x_1, x_2) = \min\{2x_1, 4x_2\}$$

$$u_B(x_1, x_2) = \min\{x_1, 5x_2\}$$

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- ☐ **True**

A's kink line: $x_2 = \frac{1}{2}x_1$. B's kink line: $x_2 = \frac{1}{5}x_1$

For any budget line, A intersects before B

Proof: $x_1^A = 4M/(4p_1 + p_2) < 5M/(5p_1 + p_2) = x_1^B$

Question 28

- **True/False:** I choose airline seats as follows:
  1) First, I look at the seat type. I prefer window over aisle, and both over middle
  2) If the seat type is the same, I take the one closest to the front (lower row number)
  My preferences are (i) complete (ii) transitive

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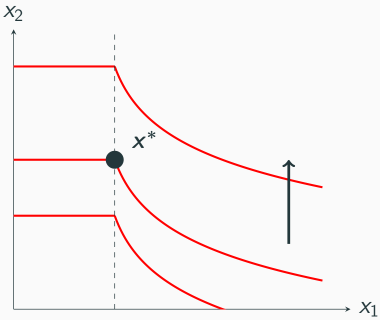
- **(i) True, (ii) True**
  Let $(x_1, x_2) = (\text{Type,Row})$. Take $x \succsim y, y \succsim z$. Four cases: 1) $x_1 = y_1 = z_1$, 2) $x_1 \neq y_1 \neq z_1$, 3) $x_1 \neq y_1 = z_1$, 4) $x_1 = y_1 \neq z_1$. Try all four and check transitivity always holds

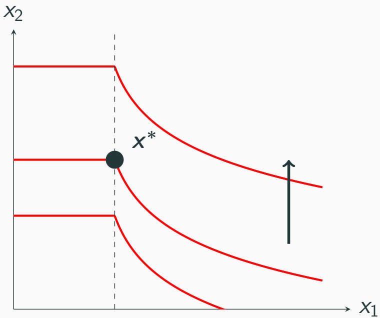
Question 29

- **True/False:** x^* is never an optimal bundle for strictly positive prices



Question 29

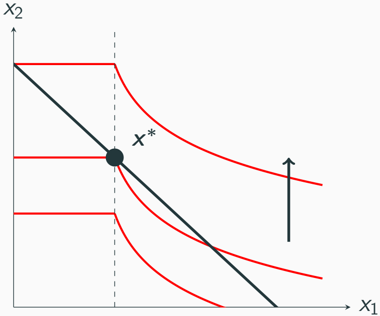
- **True/False:** x^* is never an optimal bundle for strictly positive prices



☐ **True**

Question 29

- **True/False:** x^* is never an optimal bundle for strictly positive prices

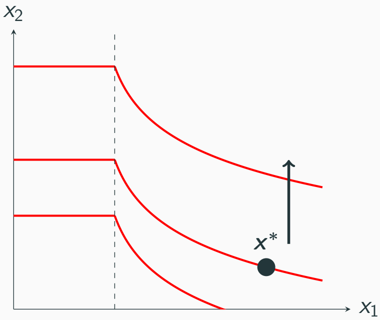


☐ **True**

BL y-intercept is always affordable and preferred to x^*

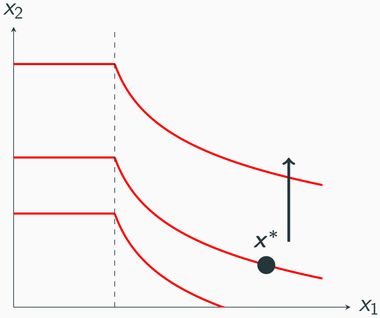
Question 30

- **True/False:** x^* is never an optimal bundle for strictly positive prices



Question 30

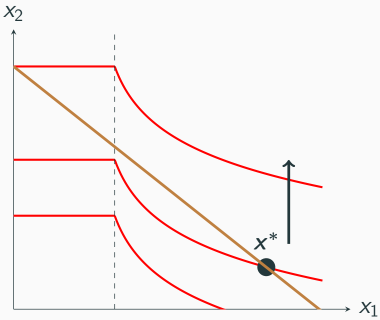
- **True/False:** x^* is never an optimal bundle for strictly positive prices



☐ **False**

Question 30

- **True/False:** x^* is never an optimal bundle for strictly positive prices

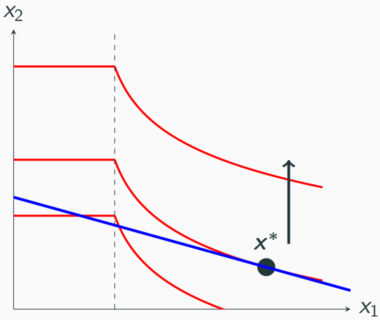


- ☐ **False**

  Sometimes **it is not** optimal.

Question 30

- **True/False:** x^* is never an optimal bundle for strictly positive prices



- **False**

  Sometimes **it is not** optimal, sometimes **it is**.