

Concordia University
Econ 301 - Intermediate Microeconomics I
Midterm Exam VA, Fall 2015

Instructor: Anca Alecsandru

This exam lasts 75 minutes. The test consists of 4 pages. Calculators are not allowed. Show all necessary steps and calculations that lead to your answer. Give concise explanations.

I. True/False - Determine whether the following statements are true or false and explain your reasoning. Credit is given based on explanations, only.

1. Donald's utility function is $U(x, y) = x + y^{1/2}$. Currently he is buying some of both goods. If his income rises and prices don't change, he will buy more of both goods.

TRUE/FALSE

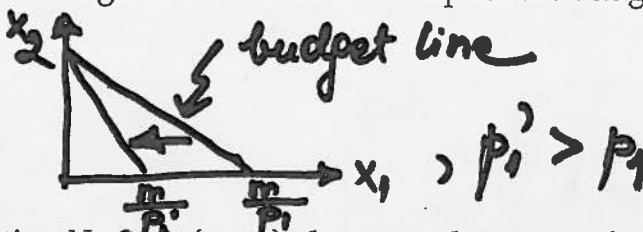
Explanation:

This U function is quasilinear, there is no income effect of an increase in m on the consumption of x .

2. If good 1 is on the horizontal axis and good 2 is on the vertical axis, then an increase in the price of good 1 will not change the horizontal intercept of the budget line.

TRUE/FALSE

Explanation:



3. If someone has a utility function $U = 2\min\{x_1, x_2\}$, then x_1 and x_2 are perfect complements for that person.

TRUE/FALSE

Explanation:

x_1 and x_2 are consumed in pairs, need equal # of x_1 and x_2 .

4. If two goods are substitutes, then an increase in the price of one of them will increase the demand for the other.

TRUE/FALSE

Explanation:

$$\frac{dx_2}{dp_1} > 0$$

as x_2 is relatively cheaper when p_1 increases and p_2 stays the same.

5. If consumers spend all of their income, it is impossible for all goods to be inferior goods.

TRUE FALSE

Explanation:

The consumers respond to a change in m by changing consumption; an increase in m would decrease consumption for all goods and so would utility.

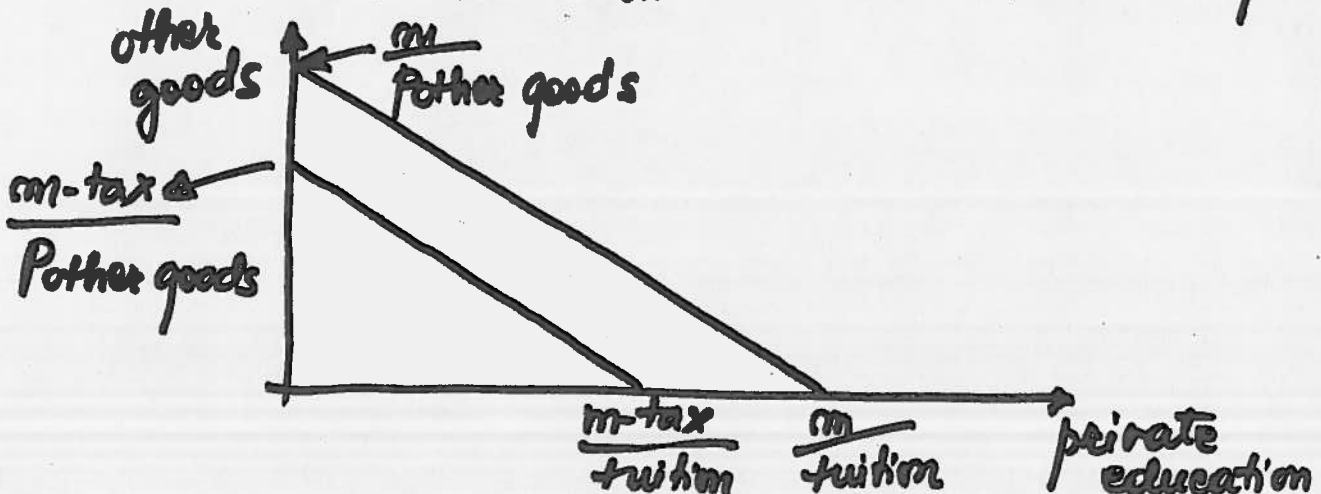
- II. Problems - Choose ONLY 2 out of 3 problems. Only 2 problems will be graded. Show all the steps and calculations for full credit.

1. Ed Moore and his family live in a city with many private schools and one public school. The Moores are thinking of sending their only child to private school because they would like a school that has more teachers and other resources per student than the local public school. The Moores must pay taxes to support local public schools whether or not their child goes to private school. There is such a variety of private schools that the Moores can get just about any level of inputs per student by choosing the appropriate private school. Tuition in the private schools equals expenditure per student. Draw a diagram to show the Moores' budget constraint. Put expenditures per student in the child's school on the horizontal axis and other goods on the vertical axis.

$$m = \text{(private) education} \times \text{tuition} + \text{other goods} \times \text{other goods}$$

When a school tax is paid by all consumers, the income decreases to $m - T$ or $m(1 - t)$, depending on how the tax is calculated.

$$m - \text{tax} = \text{private education} \times \text{tuition} + \text{other goods} \times \text{other goods}$$

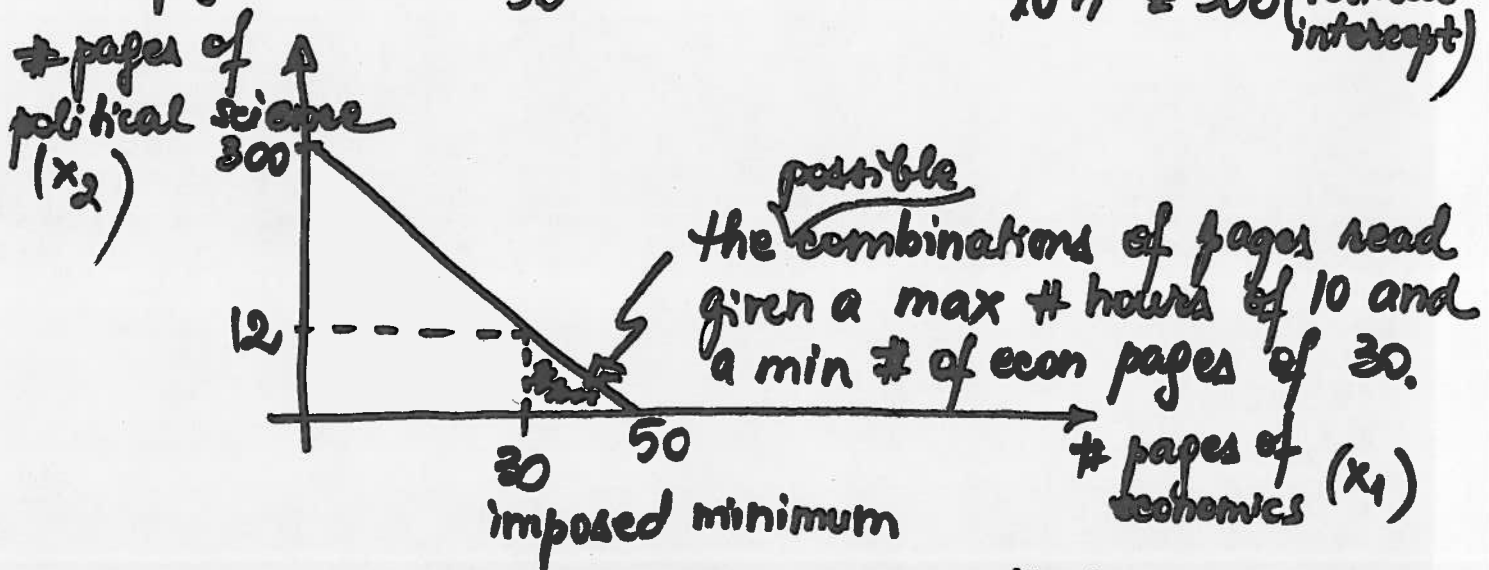


2. Felicity is studying economics and political science. She can read 30 pages of political science per hour but only 5 pages of economics per hour. This week she has a 50-page assignment in economics and a 150-page assignment in political science. Because of sorority rush, she cannot devote more than 10 hours to studying these subjects this week. She realizes she cannot complete all of her assignments but is determined to complete at least 30 pages of her economics reading. Draw a graph with pages of economics on the horizontal axis and pages of political science on the vertical axis. On this graph, show the possibilities that are consistent with the constraints that Felicity has imposed on herself. (She is allowed to read ahead in either subject.) Label key points on your graph with their numerical values.

$p = \text{time/page}$, Total time allocated to reading = 10h

For economics, 5 pages per hour are read \Rightarrow
 1 page takes $\frac{60}{5} = 12$ minutes, max # pages in 10h = 50
 (horizontal intercept)

For poli sci, 30 pages per hour are read \Rightarrow
 1 page takes $\frac{60}{30} = 2$ mins., max # of pages read in
 10h = 300 (vertical intercept)



So $x_1 \geq 30$ meaning that

$x_2 \leq 12$ pages of political science

other reasons

2. Andrew's utility function is $U(x_1, x_2) = 4x_1^2 + x_2$. Andrew's income is \$32, the price of good 1 is \$16 per unit, and the price of good 2 is \$1 per unit. What happens if Andrew's income increases to \$160 and prices do not change? (Hint: Does he have convex preferences?)

(5 points)

$$U(x_1, x_2) = 4x_1^2 + x_2$$

$$m = \$32, \quad p_1 = \$16, \quad p_2 = \$1$$

$$m' = \$160$$

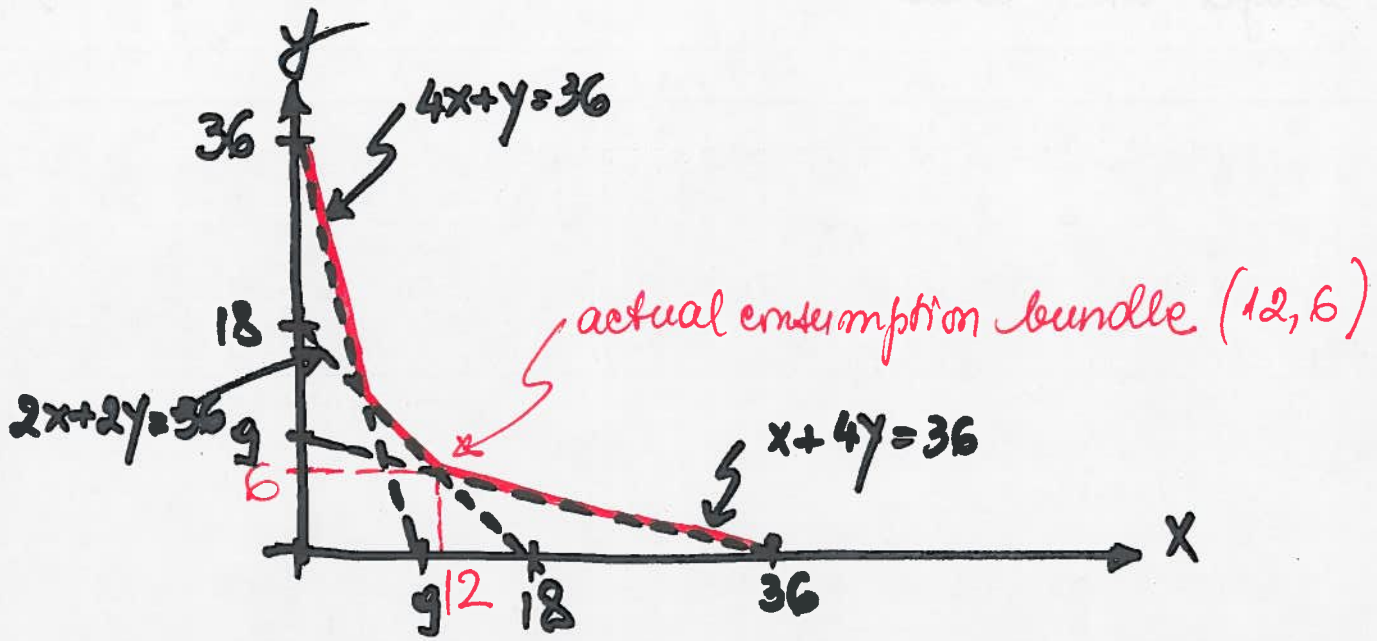
This is a *quomilinear* function (see p. 103-105 in the textbook), the demand for x_1 remains constant as income changes.

$$\max U(x_1, x_2) = 4x_1^2 + x_2 \text{ such that } p_1 x_1 + p_2 x_2 = m$$

$$\frac{MU_{x_1}}{MU_{x_2}} = \frac{p_1}{p_2} \quad ; \quad \frac{8x_1}{1} = \frac{p_1}{p_2} \Rightarrow x_1 = \frac{1}{8} \frac{p_1}{p_2},$$

independent of the level of m ; therefore, when p_1, p_2 stay the same, so does consumption of x_1 , regardless of m (i.e. the changes in m).
The *quomilinear* functions exhibit this property, of zero income effect on x_1 ; the Engel curve for good 1 is vertical.

3. Murphy's utility function is $U(x, y) = \min\{4x+y, 2x+2y, x+4y\}$. Murphy is consuming 12 units of x and 6 units of y .
- Draw the indifference curve through this point. At what points does this indifference curve have kinks?
 - The price of good x is \$1. What is the highest possible price for y ? What is the lowest possible price for y ?



From the problem we know that $x=12$, $y=6$ and we can calculate the U value.

$$U = \min\{4 \cdot 12 + 6, 2 \cdot 12 + 2 \cdot 6, 12 + 4 \cdot 6\} = \min\{54, 36, 36\}$$

$$U = 36$$

To draw the indiff curve through $(12, 6)$, set

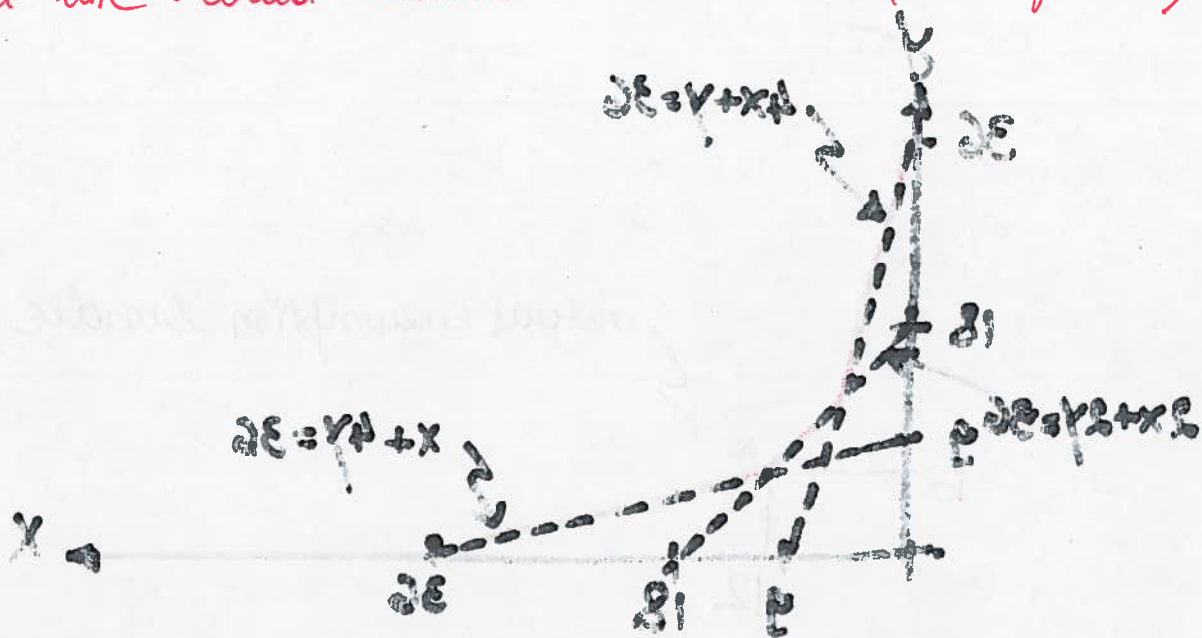
$$2x+2y = x+4y = 36$$

1) $2x+2y = 36 \Rightarrow y = 18 - x$, slope -1 , horizontal intercept $x=18$, vertical intercept $y=9$

2) $x+4y = 36 \Rightarrow y = \frac{36-x}{4}$, slope $-\frac{1}{4}$, horizontal intercept $x=36$, vertical intercept $y=9$

intercept $X = 36$, vertical intercept $Y = 9$.

Since the actual bundle is $(12, 6)$, the budget line should intersect the indifference curve (in red on the graph) at this point, so the slope of the budget line $(-\frac{P_x}{P_y} = -\frac{1}{4})$ should be between -1 and $-\frac{1}{4}$ meaning that P_y could be between 1 and 4. (the budget line could "rotate" around the $(12, 6)$ point)



From the problem we know that $X = 12$ and we can calculate the Y value.

$$Y = 36 - 4X = 36 - 4(12) = 36 - 48 = -12$$

$$Y = 18 - X = 18 - 12 = 6$$

To know the indifference curve from the point of tangency $(12, 6)$ we

$$2X + 4Y = 36 \Rightarrow 2(12) + 4(6) = 36 \Rightarrow 24 + 24 = 36 \Rightarrow 48 = 36$$

$$X - Y = 18 \Rightarrow 12 - 6 = 18 \Rightarrow 6 = 18$$

$$X + 4Y = 36 \Rightarrow 12 + 4(6) = 36 \Rightarrow 12 + 24 = 36 \Rightarrow 36 = 36$$

$$X - Y = 18 \Rightarrow 12 - 6 = 18 \Rightarrow 6 = 18$$