Practice Set 2 – KEY
Consumer Choice & Demand

This set contains problems for your own practice. It is highly recommended to work on the problems on your own. Do not just read the provided solutions. Instead, try to solve the problems and use the solutions only when you cannot continue on your own. Reading problems that someone else has solved has the same value for your preparation like watching someone else running a marathon on TV and then expecting to be able to run it, too. If you have questions on this set, please ask your section's teaching assistant.

1. For George, utility from visiting his mother-in-law is -12 and utility from watching Peppa Pig with his daughter is -6. Comment on the accuracy of the statements below:

   (a) *"George dislikes visiting his mother-in-law"*.

   We do not have adequate information to verify this statement. The fact that utility from visiting his mother-in-law is below zero means nothing on its own. The only way we could verify this statement would be if the task implied that his utility from "not visiting his mother-in-law" exceeded -12.

   (b) *"George would prefer doing nothing than visiting his mother-in-law"*.

   We cannot argue this because we do not know how much utility doing nothing yields (it does not have to be 0). If utility of doing nothing exceeds -12 the statement would be accurate. If utility of doing nothing is below -12 the statement would be inaccurate.

   (c) *"George enjoys watching Peppa Pig with his daughter twice as much as visiting his mother-in-law"*.

   Again, we cannot conclude whether this statement is true. Utility is an ordinal measurement. From each activity's utility, we can tell in what order he likes those activities, but we cannot tell by how much more he likes or prefers one from another. This statement has the same absurdity with the question "How much do you love me?".

2. Amethyst's *marginal utility* from riding a roller coaster is given in the following table.

Rides	1	2	3	4	5	6	7	8
MU	20	18	12	6	1	0	-4	-100

   (a) Given that her utility from zero rides is 0, calculate Amethyst's *utility* for rides 1 to 8.

   Utility for zero rides is given to be 0.
   Utility from 1 ride is 0 + 20 = 20 units.
   Utility form 2 rides is 20 + 18 = 38 units.
   Utility form 3 rides is 38 + 12 = 50 units.
   Utility form 4 rides is 50 + 6 = 56 units.
   Utility form 5 rides is 56 + 1 = 57 units.
   Utility form 6 rides is 57 + 0 = 57 units.
   Utility form 7 rides is 57 + (-4) = 53 units.
   Utility form 8 rides is 53 + (-100) = -47 units.

   (b) Explain the meaning of the negative marginal utility for the 7th and the 8th ride.

   Negative marginal utility simply means that if she consumed that additional unit, it would have a negative contribution to her overall satisfaction. Perhaps, during the seventh ride is when she starts feeling a bit unpleasantly dizzy and during the eighth, she gets sick.

   (c) Does Amethyst prefer 7 rides or no rides at all?

   She has 0 utility from zero rides and 53 units of utility from seven rides. She clearly is more satisfied with a total of 7 rides (even though the 7th ride on its own is undesirable) than with no rides at all.

(d) Does Amethyst prefer 8 rides or no rides at all?

She has 0 utility from zero rides and -47 units of utility from eight rides. She clearly is more satisfied with no rides at all than with eight rides.

3. A firm faces the demand function $p = 12 - 2q$, where p is the price in dollars and q is the quantity in whole units. Find how much is the elasticity of demand when the revenue is maximum.

We calculate price, revenue and price elasticity (to the next unit):

Quantity (q)	Price (from demand)	Revenue $(R = p \cdot q)$	%ΔQ	%Δp	ε_D
1	$p = 12 - 2 \cdot 1 = 10$	$10 \cdot 1 = 10$	$\dfrac{2-1}{1} = 1$	$\dfrac{8-10}{10} = -0.2$	-5
2	$p = 12 - 2 \cdot 2 = 8$	$8 \cdot 2 = 16$	$\dfrac{3-2}{2} = 0.5$	$\dfrac{6-8}{8} = -0.25$	-2
3	$p = 12 - 2 \cdot 3 = 6$	$6 \cdot 3 = \mathbf{18}$	$\dfrac{4-3}{3} = 1/3$	$\dfrac{4-6}{6} = -1/3$	$\mathbf{-1}$
4	$p = 12 - 2 \cdot 4 = 4$	$4 \cdot 4 = 16$	$\dfrac{5-4}{4} = 0.25$	$\dfrac{2-4}{4} = -0.5$	-0.5
5	$p = 12 - 2 \cdot 5 = 2$	$2 \cdot 5 = 10$	$\dfrac{6-5}{5} = 0.2$	$\dfrac{2-0-2}{2} = -1$	-0.2

In the table we can see that at the inelastic portions of the demand ($|\varepsilon_D| < 1$), revenue increases as price rises. And at the elastic portions of the demand ($|\varepsilon_D| > 1$), revenue decreases as price rises. The maximum revenue is achieved when elasticity equals -1.
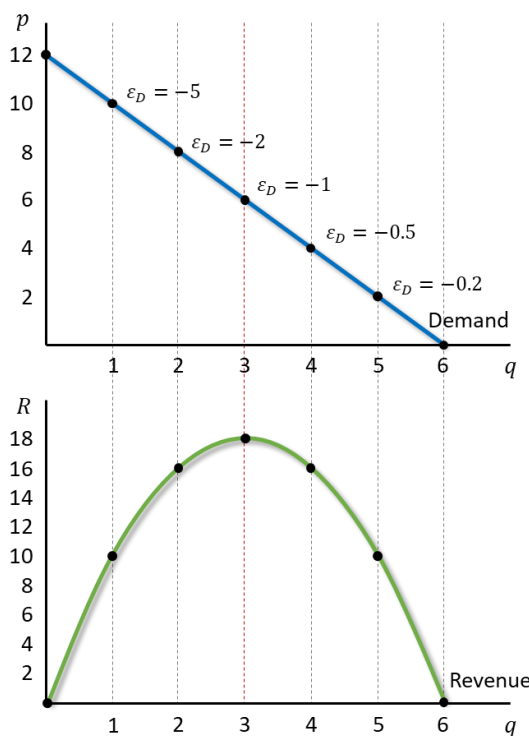
4. Angela consumes only x and y. Explain why she has not made the optimal choice between x and y if
$$\frac{MU_x}{p_x} < \frac{MU_y}{p_y}.$$
What should she do in this case?

The left-hand side (LHS) of the inequality is utility Angela receives from spending an extra dollar on x. The right-hand side (RHS) is the utility she receives from spending an extra dollar on y. If the RHS exceeds the LHS, utility coming from y is cheaper per unit than utility coming from x. Thus, Angela should buy less x and more y. Marginal utility diminishes as we consume more of any good. Thus, as Angela buys more y the RHS will decrease; and as she buys less x, the LHS will increase. As she keeps increasing y and decreasing x, the two sides of the equation will eventually become equal. Once this happens, the quantities of x and y will be the optimal ones.

5. Fernando distributes a fixed budget between books and cosmetics. This month he has spent his budget to buy 4 books and 2 bottles of cologne. The last book he bought was "The Idiot" by Feodor Dostoyevsky, for 11 dollars, which yielded 55 units of utility to him. The last bottle of cologne he bought was the Aqua Di Gio by Armani, for 80 dollars, which yielded 60 units of utility to him. Was Fernando's choice utility maximizing?

The utility per dollar Fernando received from the last book he bought was 55/11 = 5 units. The utility per dollar Fernando received from the last bottle of cologne he bought was 60/80 = 0.75 units. Fernando would be better off if he had spent more on books and less on cosmetics (which is usually the case for everyone).

6. In the lecture we derived that the *opportunity cost* of food in terms of entertainment is given by
$$OC_{food} = \frac{units\ of\ ent\ sacrificed}{units\ of\ food\ received}$$
and, also, by the ratio of prices
$$OC_{food} = \frac{price_{food}}{price_{ent}}$$
use an example to explain why those two are equivalent.

Assume that a unit of entertainment costs 20 dollars and a unit of food 10 dollars. This means that by sacrificing (not buying) a unit of entertainment you save 20 dollars, which suffice to buy 2 units of food. Thus,
$$\frac{units\ of\ ent\ sacrificed}{units\ of\ food\ received} = \frac{1}{2}$$
and
$$\frac{price_{food}}{price_{ent}} = \frac{\$10}{\$20} = \frac{1}{2}.$$
The amount of food you receive per unit of entertainment you give up, depends on the inverse ratio of prices.

7. [Optional – only for students with advanced math background] The demand function $p = 12 - 2q$ has first derivative dp/dq equal to -2. Explain why the elasticity of demand is not constant and equal to -2.

The elasticity of demand is not equal to the derivative (or slope, or gradient) but to $\frac{dq}{dp} \cdot \frac{p}{q} = -\frac{1}{2} \cdot \frac{12-2q}{q} = 1 - \frac{6}{q}$. Thus, the elasticity of demand depends on the inverse of the derivative of the demand, $\frac{dp}{dq}$ but it is not equal to it and also not constant (depends on q).

You are kindly requested to report any *typos, mistakes* or *proposals* for the improvement of this practice set key at kmarinakis@smu.edu.sg.