Exercise session #3

Lecturer: Dmytro Vikhrov
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Problem 1
The utility function is $U(x_1, x_2) = x_1 x_2$, prices are $(p_1, p_2) = (1, 1)$ and the budget is $w = 8$.

1. Derive the Hicksian compensated demand for both goods. Depict your solution.
2. Suppose that p_1 increases to $p_1^{'} = 2$. Compute the substitution effect and show it in the graph.
3. Derive the Marshallian demands for both goods. Compute the income effect and depict it in the graph. What is the total effect here?
4. Consider the total effect for all the cases: (i) normal good, (ii) inferior good, (iii) Giffen good.
5. Discuss the duality problem: $x_h^*(p, \overline{U}) = x^*(p, E(p, \overline{U}))$, $x^*(p, w) = x_h^*(p, V(p, w))$.
6. *Bonus question*: Compute CV, EV and present the solution graphically.

Problem 2
Let's compute the income and substitution effects for the case of labor supply considered on the previous lecture: $U(x, L) = \frac{x^\gamma}{\gamma} + L$, where L is leisure, and $\gamma \neq 0$. The price of labor is w, the price of the consumption good is p and the total endowment of time is 1.

1. Introduce the possibility of a non-wage income N (winning the lottery *etc*). Augment the budget constraint and derive the Slutsky equation. Derive the total effect (SE + IE) of an increase in the wage rate and show it graphically?
2. Discuss the application of this framework to the analysis of life-long labor supply.

Problem 3 (intuition only)
Recall the effect of the per-unit tax τ on the labor supply. How does the tax affect the labor supply via the income and substitution effects?

Problem 4 (if time remaining)
Show properties of the Hicksian demand, expenditure function; state the Shephard's lemma and Roy's identity.