

Advanced Microeconomics I

Fall 2026 - M. Pak

Problem Set 2: due in class, Oct. 21

1. Let $u(x) = \min \{2x_1, x_2\}$.
 - (a) Find the Hicksian demand.
 - (b) Find the expenditure function.
 - (c) Verify that the expenditure function is concave in p .
 - (d) Find the indirect utility function using the duality relationship.
 - (e) Find the Marshallian demand.

2. Consider a consumer whose utility function over food and clothing is $u(x_f, x_c)$. The consumer has income w and faces prices $p = (p_f, p_c)$. Suppose further that she lives in a country where clothing is taxed but food is not. Tax on clothing is *ad valorem* so that the effective price consumer pays on clothing is $(1 + t)p_c$, where t is the tax rate.

- (a) Formulate the consumer's utility maximization problem.
- (b) Suppose the consumer's indirect utility function is given by

$$v(p, t, w) = \frac{3w^2}{16(1+t)p_f p_c}.$$

Derive the Marshallian demands for clothing and food, $x_c(p, t, w)$ and $x_f(p, t, w)$. How do they change as t changes?

- (c) Derive the expenditure function, $e(p, t, u)$ and the Hicksian demands. How do they change as t changes? Interpret these results.

3. A consumer's expenditure function is given by

$$e(p, u) = (p_1^{-2} + p_2^{-2})^{-\frac{1}{2}} u.$$

- (a) Find the Slutsky matrix.
- (b) Find the substitution effect, the income effect, and total effect, on good 1 arising from the change in the price of good 2.

4. Consider the following two-period consumption and savings problem. There is a single good which costs p in both periods. The consumer's utility from consuming x_1 amount of the good in period 1 and x_2 amount of the good in period 2 is given by $u(x_1, x_2)$. Assume that $u(\cdot)$ satisfies the standard properties. The consumer receives wealth W in period 1 and no wealth in period 2. However, any wealth she doesn't spend in period 1 can be saved at interest rate r . That is ¥1 saved in period 1 returns ¥ $(1 + r)$ in period 2.
- What is the budget constraint for the consumer?
 - Find the income and the substitution effects of p on x_1 .
 - Find the income and the substitution effects of r on x_2 .
5. Ellsworth's utility function is $u(x_1, x_2) = \min \{x_1, x_2\}$. Ellsworth has ¥150 and the price of the two goods are both ¥1. Ellsworth's boss is thinking of sending him to another town where the price of good 1 is ¥1 and the price of good 2 is ¥2. The boss offers no raise in pay. Ellsworth, who understands compensating and equivalent variation perfectly, complains bitterly. He says that although he doesn't mind moving for its own sake and the new town is just as pleasant as the old, having to move is as bad as a cut in pay of ¥ A . He also says that he wouldn't mind moving if when he moved he got a raise of ¥ B . What are A and B equal to?