Midterm Exam

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EI037 Microeconomics

This is a closed book exam. You need to solve this exam alone and independently. Your answers should be legible, clear, and concise. In order to get full credit you have to give complete answers, including how answers are derived. Partial answers will lead to partial credit. Wrong additional statements (i.e., guessing) might reduce the given credit.

You have 2 hours to complete this exam. Each sub-question is worth 0.5 points, adding up to a total of 6 points. Allocate your time wisely across questions. Good luck!

1. Weak Axiom and Consumer Choice

Let the consumer demand $x(p, w)$ be single valued, homogeneous of degree zero, and satisfies Walras' law. We learned the following definition of the **weak axiom of revealed preference (WA)** in the context of the Walrasian demand function:

> The demand function $x(p, w)$ satisfies the WA, if for any two price-wealth situations (p, w) and (p', w'), we always have that $p \cdot x(p', w') \leq w$ and $x(p', w') \neq x(p, w) \Rightarrow p' \cdot x(p, w) > w'$.

1.a. Explain in words the intuition behind the definition of the WA provided above.

1.b. Provide one graphical example when the WA is violated, and one example when the WA is not violated.

1.c. What is a compensated price change (i.e., Slutsky compensation)? Explain graphically.

1.d. Provide a graphical example such that $x(p, w)$ satisfies the WA and the compensated law of demand, but **NOT** the *uncompensated* law of demand.

[Hint: *In case you don't remember the definition*]

> We say that the **compensated law of demand (CLD)** holds if for any compensated price change from an initial price-wealth situation (p, w) to a new price-wealth pair $(p', w') = (p', p' \cdot x(p, w))$ we have
>
> $$(p' - p) \cdot [x(p', w') - x(p, w)] \leq 0$$
>
> with strict inequality whenever $x(p, w) \neq x(p', w')$.

2. Classical Demand Theory

Consider the utility function

$$u(x) = x_1^{\frac{1}{3}} x_2^{\frac{2}{3}}$$

2.a. Find the Walrasian demand function for goods 1 and 2 as a function of prices and wealth.

2.b. Find the Hicksian (compensated) demand function $h(p, u)$ for goods 1 and 2.

2.c. Find the expenditure function $e(p, u)$, and verify that $h(p, u) = \nabla_p e(p, u)$.

2.d. Find the indirect utility function $v(p, w)$, and verify Roy's identity.

3. Welfare Economics

3.a. Consider an economy with two goods, 1 and 2. Consider a price change from the initial price vector p^0 to a new price vector $p^1 \leq p^0$ in which only the price of good 1 changes. Show that $CV \leq EV$ if good 1 is a normal good.

3.b. Consider an economy with two goods, 1 and 2. Consider a price change from the initial price vector p^0 to a new price vector $p^1 \leq p^0$ in which only the price of good 1 changes. Show that $CV \geq EV$ if good 1 is an inferior good.

3.c. Patrick's utility function is $u(x_1, x_2) = x_1^{\frac{1}{2}} x_2^{\frac{1}{2}}$, where good 1 is food and good 2 is housing. Patrick gets a monthly salary of \$3000. The price of good 1 and the price of good 2 are $p_1 = 2$ and $p_2 = 2$. Patrick's boss is thinking of sending him to another town where the price of food is the same, but the price of housing is 8. The boss offers no raise in pay. Patrick, who understands compensating and equivalent variations 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 he wouldn't mind moving if - when he moved - he got a raise of \$B. What are A and B equal to?

3.d. Patrick's boss does not understand the concepts of compensating and equivalent variations, but he understand the concepts of Marshallian demand and consumer surplus. So he offers offer to raise Patrick's salary by \$C if Patrick moves. What is C equal to?