

Econ 3012 - Fall 2023 Midterm Solutions

1. Briefly answer the following in a way that a person who **has not studied economics or mathematics would understand**:

A. Why is the relation “is a friend of ” **not a transitive** relation? *The relation “is a friend of” allows us to say something about how two people are connected. If I know that Sarah is a friend of Steve and Steve is a friend of Philip, transitivity would mean that Sarah is a friend of Philip. Friendship is clearly a relation that doesn’t allow us to make that conclusion. A similar relation that is transitive would be “is a sibling of.”*

B. What is an **elasticity**? *An elasticity tells us about how sensitive the demand for a good is in response to changes in factors like price and income. For example, price elasticity expresses the percentage change in demand for a good when we increase the price by 1%.*

C. What is the **marginal rate of substitution**? *The marginal rate of substitution describes the amount of one good that consumer is willing to give up in order to receive more of another good.*

2. Fill in the blank.

A. An ordinary good is one where demand **decreases** when **price** increases.

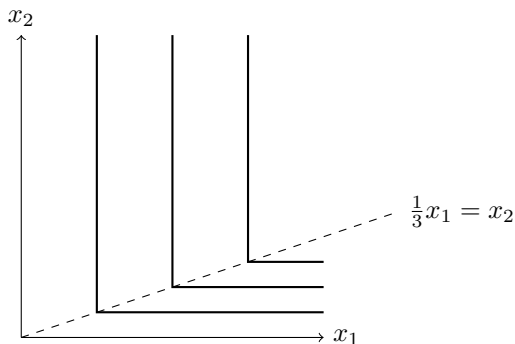
B. If $(2, 2) \succ (4, 0)$ and $(2, 2) \prec (0, 4)$, preferences are not **convex**.

C. If demand for a good is elastic then a 1% increase in the price of that good will lead to **more than** 1% decrease in demand.

3. A consumer has utility function $u(x_1, x_2) = \min\{\frac{1}{3}x_1, x_2\}$. Prices are p_1 and p_2 and the consumer’s income is m .

A. What is the equation for this consumer’s budget line? $p_1x_1 + p_2x_2 = m$

B. Sketch a few of this consumer’s indifference curves.



Suppose: $p_1 = 1, p_2 = 6, m = 900$

C. What is the consumer’s demand for x_2 ? $x_2 = \frac{m}{3p_1+p_2} = 100$

D. Suppose p_2 changes to $p'_2 = 12$. How much of the consumer’s decrease in demand for x_2 is due to the substitution effect? *None of the change in demand is due to the substitution effect.*

4. A consumer has endowment $\omega_1 = 5, \omega_2 = 5$. Their utility function is $u(x_1, x_2) = x_1 + x_2$. Assume $p_1 = 2$ and $p_2 = 4$

A. What is this consumer’s budget equation? $2x_1 + 4x_2 = 30$

B. What is the optimal bundle of x_1 and x_2 for this consumer? $x_1 = 15, x_2 = 0$

C. In part B, is this consumer a borrower or a net buyer or net seller of x_1 ? *Net buyer*

D. If p_1 decreases to $p_1 = 1$ is the consumer better off or worse off? *Better off; the consumer still chooses to buy only x_1 , and the decrease in prices means they can now afford 25 units of x_1 .*

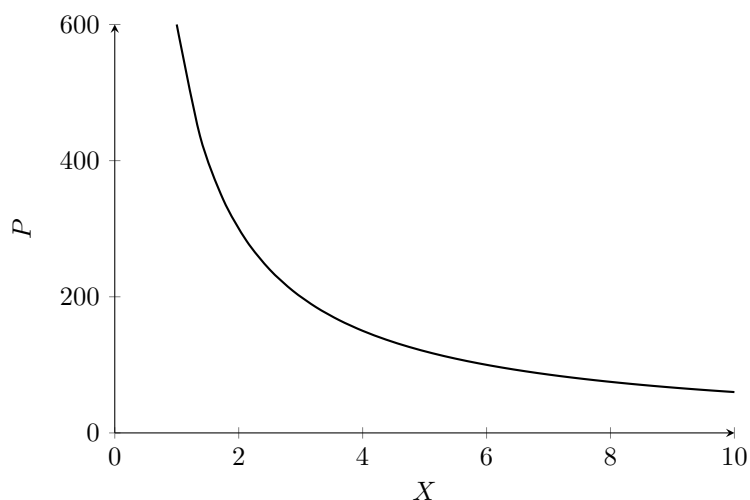
5. Three consumers have the same demand for some good x . Each has income m and the price of the good is P . Their demands are each $x = \frac{m+100}{P}$

A. What is each consumer's income elasticity? If a consumer's income goes up by 1% does their demand for this good go up by more than, less than, or exactly 1%?

$\eta = \frac{m}{m+100}$; *demand goes up by less than 1%*

B. What is the market demand for this good? $X = \frac{3m+300}{P}$

C. Let $m = 100$. Plot the market inverse demand. *Inverse market demand is $P = \frac{600}{X}$*



D. Can we use the representative consumer property for this market? *No. In order to use the representative consumer property, it would need to be that case that market demand with individual income $m = 100$ is the same as what an individual would choose with the aggregate income $M = 300$. In this case, market demand is $X = \frac{600}{P}$, while individual's demand would be $x = \frac{300+100}{P} = \frac{400}{P}$, which are clearly not equal.*