Mathematical Economics

Quiz 1 Questions

1. Solve the following optimization problems:

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1. Suppose that a cake is shared among two individuals. Their utility functions are

where is the share that individual gets.

1. Show that is Pareto-efficient.
2. Show that is Pareto-inefficient.
3. Is equal sharing Pareto-efficient?

Remark: Note that the utility of individual 1 is not always increasing as she consumes more cake. In particular, if then

This means “individual 1 is less happy when she eats more than the quarter of the cake”.

1. Suppose that two individuals share cake and coffee. The available amount of cake is and the available amount of coffee is . Their utility functions are
2. First equality. Show that equal sharing is Pareto-efficient.
3. Now inequality. Show that and is also Pareto-efficient.

Remark: These two questions (a) and (b) carry an important message: Inequality does not prevent efficiency. Unequal outcomes can be very well efficient.

1. Suppose and . Individual 1 offers exchanging 1 (small) unit of for 1 (small) unit of to individual 2. “Give me 1 piece of y, I will give you 1 piece of x” is the offer. Would they agree?
2. Using your answer above, decide whether and is efficient.