

Econ 8100 Midterm

October 20, 2022

1. A consumer has preferences over cups of coffee (t, m) . t is temperature (in Celsius) $t \in [0, 100]$. For reference $t = 0$ is coffee ice cubes and $t = 100$ is boiling coffee. m is proportion of milk $m \in [0, 1]$. For reference $m = 0$ is black coffee and $m = 1$ is a cup of milk. Assume preferences are complete and transitive.

A. Describe a reasonable and intuitive scenario where preferences over (t, m) are not monotonic.

B. Describe a reasonable and intuitive scenario where preferences over (t, m) are not convex.

C. Describe a reasonable and intuitive scenario where preferences over (t, m) do not meet the following assumption: $(t, m) \succsim (t, m') \Leftrightarrow (t', m) \succsim (t', m')$

2. Suppose the choice set $X = \{(2, 2), (3, 1), (1, 3), (2, 0), (0, 2), (1, 1)\}$. Assume that \succsim is complete, transitive, and anti-symmetric ($x \sim y$ if and only if $x = y$), monotonic, convex, and independent ($x \succsim y \Leftrightarrow x + a \succsim y + a$).

A. What restrictions does monotonicity put on \succsim ?

B. Suppose you observe a consumer choose $(2, 0)$ from the set $\{(2, 0), (1, 1), (0, 2)\}$ and choose $(1, 3)$ from the set $\{(2, 0), (1, 3)\}$. What is their rank ordering of the set X ?

3. A consumer has utility function $u(x_1, x_2, x_3) = x_1x_2 + x_3$ and budget $x_1 + x_2 + x_3 \leq m$.

A. Suppose the consumer decides to spend some part of their budget \tilde{m} on x_1 and x_2 such that $x_1 + x_2 = \tilde{m}$. What is the optimal amount of x_1, x_2 to buy?

B. Write the consumer's achievable utility as a function of \tilde{m} and m refer to this as $V(m, \tilde{m})$.

C. Sketch $V(10, \tilde{m})$

D. Is $V(m, \tilde{m})$ convex or concave in \tilde{m} ?

E. What is the optimal \tilde{m} as a function of m ?

F. What is the consumer's optimal x_1, x_2, x_3 as a function of m ?

G. What is this consumer's marginal utility of money as a function of m ?