$20^{\text {th }}$ November 2023

## Section 1 (Only one choice is correct.)

1. Is the following statement true or false? Based on von Neumann and Morgenstern Theorem (Expected Utility Theory), if a decision maker prefers Lottery A to Lottery B, $A \succ B$, then such a preference maintains when both lotteries are combined with a third Lottery $C$ in the same way, $\lambda A+(1-\lambda) C>\lambda B+(1-\lambda) C$. Which axiom does the description refer to?
A: Completeness
B: Transitivity
C: Continuity
D: Independence
2. Which of the following games is not a sequential game?

A: Dictator game
B: Ultimatum game
C: Trust game
D: All the above games are sequential games.
3. Consider a utility function, $u(x)$, where $x$ is the payoff. The first order derivative, $u^{\prime}(x)>0$ and the second order derivative, $u^{\prime \prime}(x)=0$. Which of the following statements best describes the utility function $u(x)$ ?
A: Under Expected Utility theory, the utility function implies risk seeking.
B: Under Prospect theory, the utility function implies risk neutrality.
C: Under Disappointment Aversion model, the utility function implies risk seeking.
D: Under Expected Utility theory, the utility function implies risk neutrality.
4. Which of the following models features that nears future is discounted more than far future?
A: Exponential discounting model
B: Hyperbolic model
C: Quasi-hyperbolic model
D: None of above
5. Suppose that a decision maker's other-regarding preferences are contextdependent, and the decision maker's preferences can be represented by the utility function,
$U(x, y)= \begin{cases}x-b(x-y), & x \geq y \\ x-a(y-x), & x<y\end{cases}$
where x is the payoff of the decision maker, and y is the payoff of someone else. Suppose the indifference curves that describe the preferences of the decision maker
are shown in the graph below. What values of the parameters, $a$ and $b$, are associated with the indifference curves in the graph?


A: $a=0, b=0$
B: $0<a<1,-1<b<0$
C: $a>0, b=0$
D: $a=0, b \rightarrow \infty$
6. Which of the following is correct?

A: Under Expected Utility Theory, a convex utility function implies risk aversion.
B: In Prospect Theory, a linear probability weighting function implies risk neutrality.
C: A decision maker is risk seeking if for her the certainty equivalent of a lottery is higher than the expected payoff of the lottery.
D: In Disappoint Aversion model, disappointment aversion implies risk aversion.
7. Which of the following is correct?

A: Consider the individual learning, if there is a large enough number of signals, an agent can learn the state of the world regardless of the precision of the signals.
B: Consider the simple model of herd (information cascade), herds form and persist if the updates of beliefs are not bounded.
C: Consider the simple model of herd (information cascade), herds form and persist if the actions are coarse instead of binary choices of actions.
8. Probability weighting function in Prospect Theory reflects the subjective assessment of the objective probability attached to an outcome.
A: True
B: False
C: Cannot say

## Section 2

1. Briefly explain the learning process in Cournot competition.
2. Suppose that a decision maker uses Prospect Theory to evaluate the lottery $L=$ ( $x_{1}, p ; x_{2}, 1-p$ ) where $x_{1}<0, x_{2}<0$ and $0<p<1$. Suppose that the utility function for losses is given by $v(x)=-3 \sqrt{-x}$ and the reference point of the decision maker is zero, $u(0)=0$. The probability weighting function is denoted as $w(p)$.
(a) What is the value of the coefficient of loss aversion?
(b) Write the expression of the utility of the lottery. Note that the decision maker follows Prospect Theory, $V(L)=\sum_{x_{i}} \pi\left(p_{i}\right) v\left(x_{i}\right)$. You do not need to compute anything and an expression with nations is sufficient.
3. Briefly explain description invariance.
4. Briefly describe Allais Paradox.
5. Briefly explain Endowment Effect.
6. Briefly explain Disposition Effect.
7. Briefly explain Projection bias.

## Section 3

Sam has reference-dependent preferences over pairs of shoes ( $c_{s}$ ) and money ( $c_{m}$ ). His utility takes the form: $U\left(c_{s}, c_{m}\right)=u\left(c_{s}-r_{s}\right)+v\left(c_{m}-r_{m}\right)$, where $r_{s}$ is Sam's reference point for pairs of shoes and $r_{m}$ is his reference point for money. The function $u$ is defined by

$$
u(x)=\left\{\begin{array}{cc}
10 \sqrt{x}, & \text { if } x \geq 0 \\
-20 \sqrt{|x|}, & \text { if } x<0
\end{array}\right.
$$

and the function $v$ is defined by

$$
v(x)=\left\{\begin{array}{cc}
\sqrt{x}, & \text { if } x \geq 0 \\
-2 \sqrt{|x|}, & \text { if } x<0
\end{array}\right.
$$

Sam currently has 7 pairs of shoes (1 pair for each day of the week) and 100 euro in cash. You may restrict calculations to two decimals.

1. Provide a brief interpretation of Sam's preferences. In the gain domain (i.e., for $\boldsymbol{c}_{\boldsymbol{s}} \geq$ $r_{s}$ and $c_{m} \geq r_{m}$ ), is he risk-averse, risk-neutral, or risk-loving? In the loss domain (i.e., for $c_{s}<r_{s}$ and $c_{m}<r_{m}$ ), is he risk-averse, risk-neutral, or risk-loving? Why?
2. Would Sam experience greater aggravation from losses of shoes than from gains of shoes? What about the cash? Is the difference of aggravation between gains and losses the same for shoes and cash?
3. Suppose first that Sam's reference points reflect the status quo, so that $r_{s}=7$ and $r_{m}=100$. Sam is walking down the street when he sees an ad for a pair of Nike shoes priced at $p=20$ euro. Is Sam willing to buy the pair of shoes at this price? Why yes/no?
4. Sam continues walking down the street and runs into his friend John. They begin talking about shoes, and Sam learns that John only owns 6 pairs of shoes (1 pair for each weekday and 1 pair for the weekend). Now self-conscious about how many shoes he owns, Sam updates his shoe reference point to $r_{s}=6$. The reference point of cash is still $r_{m}=100$. Given Sam owns 7 pairs of shoes now, is Sam still willing to buy the advertised Nike shoes at $p=20$ ? Why yes/no?
5. Sam walks some more and runs into his other friend Jim. They begin talking about shoes, and Sam learns that Jim also owns 7 pairs. No longer self-conscious about his shoe consumption, Sam updates his shoe reference point back to $r_{s}=7$. The reference point of cash is still $r_{m}=100$. Sam and Jim decide to go to the Nike store to check out the advertised shoes. When Sam walks into the store, what is his maximum willingness to pay for the pair of shoes? [Hint: the maximum willingness to pay is achieved when Sam is indifferent between buying and not buying.]
6. Sam enters the Nike store and grabs the pair of shoes off the shelf. He is pleased about his impending shoe purchase and is excited to go home and try them out, so
he updates his reference points to reflect the new status quo: $r_{s}=8$ and $r_{m}=$ $100-20=80$. Once at the register, Sam is informed by the cashier that the pair of shoes costs 20 euro more as some campaign is just over, so that the total price is now $p+20=40$. Is Sam now willing to buy the pair of shoes? Why yes $/ n o$ ?
7. Use your answer in the last Question 6 to explain why firms often find it profitable to impose unanticipated extra charge at the end of a transaction rather than observing a decrease of sales, e.g., small-order fee from food-delivery and processing fees of a concert tickets.
