Economics 316

Fall 2017 Martin J. Osborne

Problem Set 1

1. Determine whether each of the games in the following figure is the same (except for the names of the actions) as the game *Bach or Stravinsky?* (as specified in class).

	X	Y
X	$100, 2$	$1, 0$
Y	$1, 0$	$2, 3$

	X	Y
X	$3, 2$	$0, 0$
Y	$1, 1$	$2, 3$

2. Consider the strategic game

	L	R
T	$2, 1$	$5, 2$
B	$3, 0$	$4, 4$

Which of the following statements are correct?

(a) (T, L) is not a Nash equilibrium because both players are better off at (B, R).

(b) (T, L) is not a Nash equilibrium because player 1 prefers B to T when player 2 chooses L.

(c) (T, L) is not a Nash equilibrium because player 2 prefers R to L when player 1 chooses T.

(d) (T, L) is a Nash equilibrium.

(e) (B, R) is a Nash equilibrium because player 2 is worse off if she deviates to L.

(f) (B, R) is not a Nash equilibrium because player 1 is better off if she deviates to T.

3. Each of n people chooses whether to contribute a fixed amount toward the provision of a public good. The good is provided if and only if at least k people contribute, where $2 \leq k \leq n$; if it is not provided, contributions are not refunded. Each person ranks outcomes from best to worst as follows: (*i*) any outcome in which the good is provided and she does not contribute, (*ii*) any outcome in which the good is provided and she contributes, (*iii*) any outcome in which the good is not provided and she does not contribute, (*iv*) any outcome in which the good is not provided and she contributes.

   Formulate this situation as a strategic game and find its Nash equilibria. (Is there a Nash equilibrium in which more than k people contribute? One in which k people contribute? One in which fewer than k people contribute? (Be careful!))

4. Each of n people wants to travel from A to B, where n is an even number. Two routes are available. The travel time on route X is $1 + k_1$, where k_1 is the number of people who take that route, and the time on route Y is $2 + k_2$, where k_2 is the number of people who take that route. Each person prefers one outcome to another if and only if her travel time in the first outcome is less than it is in the second outcome.

   (a) Formulate this situation as a strategic game.

   (b) Find the Nash equilibria of the game. (Before thinking about the case of an arbitrary number, n, think about the case of $n = 100$.)

   (c) Find the set of Pareto efficient outcomes and thus determine whether the Nash equilibria are Pareto efficient and whether any outcomes that are not Nash equilibria are Pareto efficient.