Exercise sheet 1

Patrick Loiseau

Game Theory, Fall 2015

Exercise 1: Iterative deletion and Nash equilibria in a 2 players game

Consider the following game:

	L	C	R
T	$(2,0)$	$(1,1)$	$(4,2)$
M	$(3,4)$	$(1,2)$	$(2,3)$
B	$(1,3)$	$(0,2)$	$(3,0)$

1. What strategies survive iterative deletion of strictly dominated strategies?

   Answer: Stage 1: B dominated by T for player 1. Stage 2: C dominated by R for player 2.

2. Find all (pure strategy) Nash equilibria.

   Answer: (T, R) and (M, L).

3. Is there a NE that Pareto dominates other NE? Give all NE that are Pareto optimal.

   Answer: No NE dominates the other. Both are Pareto optimal.

Exercise 2: Nash equilibria in a 2 players game with parameters

Consider the following game:

	L	C	R
T	$(a,1)$	$(1,0)$	$(2,b)$
M	$(4,8)$	$(3,4)$	$(4,1)$
B	$(1,0)$	$(0,2)$	$(8,2)$

$a, b \in \mathbb{R}$.

Find all (pure strategy) Nash equilibria.

Answer: (B, R) $\forall a, b \in \mathbb{R}$**, (T, L) if** $a \geq 4$ **and** $b \leq 1$**, (M, L) if** $a \leq 4$**,** $\forall b \in \mathbb{R}$**.**

Exercise 3: Iterative deletion and Nash equilibria in a 3 players game

Consider the following game, in which player 1 chooses the row, player 2 the column and player 3 the matrix:

V

	L	R
T	$(1,3,1)$	$(1,2,0)$
M	$(3,2,0)$	$(0,3,1)$
B	$(0,1,1)$	$(3,2,0)$

W

	L	R
T	$(1,1,0)$	$(1,0,1)$
M	$(2,1,1)$	$(3,2,0)$
B	$(3,0,0)$	$(0,3,1)$

1. What strategies survive iterative deletion of strictly dominated strategies?

   Answer: Stage 1: T dominated by $\frac{1}{2}$M + $\frac{1}{2}$B for player 1. Stage 2: L dominated by R for player 2.

2. Find all (pure strategy) Nash equilibria.

   Answer: There are no pure strategy Nash equilibria.