Chapter 1 Exercises: Nash equilibrium

Exercise 1: Stag hunt

Offering an analogy for social cooperation Jean-Jacques Rousseau described a situation in which two individuals go out on a hunt. Each can individually choose to hunt a stag (S) or hunt a hare (H). Each player must choose an action without knowing the choice of the other. If an individual hunts a stag, he must have the cooperation of his partner in order to succeed. But cooperation is not sufficient: probability to catch a stag is 10%. An individual can get a hare by himself. In fact, the probability to catch a hare is a little bit higher if the hunter is all alone: 80%; and 70% otherwise. A hare is worth 20 times less than a stag. Solve the game.

Exercise 2: Ostentatious consumption

Two consumerist fellows would like to buy an ostentatious good. The problem is that each prefers to be the only buyer. The price of the good is so high, that each prefers not buying it if the other already bought it. The good sparks jealousy in the sense that if one fellow does not have the good, he prefers neither does the other.

Offer a normal form of the game and solve it.

Exercise 3: Mars and Venus

Venus and Mars are competing to change earth's climate. Venus prefers extreme conditions. Mars (God of Spring) prefers intermediate conditions. Gods' payoffs are given by the following table:

Venus\Mars	Hot	Cold
Hot	(20,0)	(0,10)
Cold	(0,90)	(20,0)

Find any Nash equilibrium. Give a graphical representation of the equilibrium.

Exercise 4: 3x3 Matrix

Give the Nash equilibrium to the following game:

1\2	Le	M	R
H	(1,0)	(6,4)	(0,9)
M	(5,5)	(1,6)	(3,3)
Lo	(3,2)	(2,3)	(4, 0)

Exercise 5: Employee inspection

An employer can inspect his employee at cost h. The employee can either work or laze. Employee's disutility to work is g. The employer values the work at v. The wage is w. If the employer inspects a lazing employee, the wage is not paid. Suppose $0 < h < g < w$.

1. Depict this situation by a game with simultaneous actions.
2. Does the game possess any Nash equilibrium in pure strategies? Why?
3. Show that there is a unique Nash equilibrium in mixed strategies. Give this equilibrium.
4. How does vary each strategy with the costs?