EVOLUTION AND THE THEORY OF GAMES

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Exercises 21-09-2016

4. **(a)** Show that if $x_i \in \mathbb{X}$ is a strictly dominated pure strategy and $(\hat{x}, \hat{y}) \in \mathbb{X} \times \mathbb{Y}$ is a Nash equilibrium, then x_i cannot be in the support of $\hat{x}$. **(b)** Show that this conclusion need not be true if x is only weakly dominated. To show the latter, use the payoff matrix

	y_1	y_2	y_3
x_1	3 , 2	3 , 0	2 , 2
x_2	1 , 0	3 , 3	0 , 3
x_3	0 , 2	0 , 0	3 , 2

5. From Wikipedia: "In game theory, the Stag Hunt is a game that describes a conflict between safety and social cooperation." It describes "a situation in which two individuals go out on a hunt. Each can individually choose to hunt a stag or hunt a hare. Each player must choose an action without knowing the choice of the other. If an individual hunts a stag, they must have the cooperation of their partner in order to succeed. An individual can get a hare by themself, but a hare is worth less than a stag." Calculate all Nash equilibria (pure and mixed) for the Stag Hunt with payoff matrix

	Stag	Hare
Stag	2 , 2	0 , 1
Hare	1 , 0	1 , 1

N.B., a stag is a male deer.

6. Calculate all ESS-s (pure and mixed) for the Hawk-Dove game with payoff matrix

	H	D
H	$\frac{R-C}{2}$, $\frac{R-C}{2}$	R , 0
D	0 , R	$\frac{R}{2}$, $\frac{R}{2}$

Distinguish between the cases **(a)** $R > C$, **(b)** $R = C$ and **(c)** $R < C$.