EVOLUTION AND THE THEORY OF GAMES

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Exercises 11-11-2011

1. Take the example of Big Joe and Little Joe under the banana tree (page 4 of lecture notes 01-11-2011), and solve, if possible, for dominant strategy solutions if **(a)** Little Joe makes the first move and if **(b)** both players move simultaneously. **(c)** Suppose Big Joe decides who is going to make the first move. How would you model this situation and how would you solve it?

2. Solve the following game, if possible, for dominant strategy solutions:

	y_1	y_2	y_3	y_4
x_1	4 , 5	5 , 3	5 , 6	4 , 4
x_2	5 , 3	2 , 1	3 , 5	5 , 2
x_3	2 , 6	6 , 3	4 , 2	5 , 5

3. Find all Nash equilibria (mixed and pure) of the Hawk-Dove game for $R > C$ and for $R < C$:

	H	D
H	$(R-C)/2$, $(R-C)/2$	R , 0
D	0 , R	$R/2$, $R/2$

4. Suppose that $(\hat{x}, \hat{y})$ is a Nash equilibrium Show that $\pi_1(x, \hat{y}) = \pi_1(\hat{x}, \hat{y})$ for every pure strategy x in the support of $\hat{x}$.

5. Show that every dominating strategy solution is a Nash equilibrium, but that the reverse is not necessarily true.

6. Show that if $x \in \mathbb{X}$ is a *strictly* dominated pure strategy and $(\hat{x}, \hat{y}) \in \mathbb{X} \times \mathbb{Y}$ is a Nash equilibrium, then x cannot be in the support of $\hat{x}$. 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