EVOLUTION AND THE THEORY OF GAMES

Exercises 14-2-2013

8. (8 points) Show that in a (symmetric) 2-by-2 payoff matrix game, the ESS conditions are equivalent to

$$\pi_1(x, x') < \pi_1(x', x')$$

or

$$\pi_1(x, x') = \pi_1(x', x') \text{ and } \pi_1(x, x) < \pi_1(x', x)$$

for every *pure* strategy $x \neq x'$. (Remark: x' doesn't need to be a pure strategy.)

9. Calculate all evolutionarily stable strategies (pure and mixed) for the Hawk-Dove game

	H	D
H	$\frac{1}{2}R - \frac{1}{2}C, \frac{1}{2}R - \frac{1}{2}C$	$R, 0$
D	$0, R$	$\frac{1}{2}R, \frac{1}{2}R$

for **(a)** (2 points) $R > C$, **(b)**(2 points) $R = C$ and **(c)**(2 points) $R < C$.

10. Extend the Hawk-Dove game with a third strategy called "Bully" (B) who plays Hawk against Dove but Dove against Hawk, and also Dove against itself. Give the payoff matrix of the Hawk-Dove-Bully game and calculate all ESSs for **(a)**(3 points) $R > C$ and **(b)**(3 points) $R < C$.