EVOLUTION AND THE THEORY OF GAMES

STEFAN GERITZ & BRITTANY ROSE, HELSINKI, 2014

Exercises 14-11-2011

9. Show that if x is a mixed ESS of a game with finitely many pure strategies, then $\pi(x', x) = \pi(x, x)$ for every *pure strategy* x' in the support of x.

10. Prove or disprove that in a game with two pure strategies 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* $x' \neq x$.

11. 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)** $V > C$ and **(b)** $V < C$.

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

13. 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)** $V > C$ and **(b)** $V < C$.