

NONCOOPERATIVE GAME THEORY — ECE594D: HOMEWORK #3

Exercise 9. Use Matlab to compute Nash policies for the following two games:

1. battle of the sexes with

$$A = \underbrace{\begin{bmatrix} -2 & 0 \\ 3 & -1 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices} \qquad B = \underbrace{\begin{bmatrix} -1 & 3 \\ 0 & -2 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices}$$

2. prisoners' dilemma

$$A = \underbrace{\begin{bmatrix} 2 & 30 \\ 0 & 8 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices} \qquad B = \underbrace{\begin{bmatrix} 2 & 0 \\ 30 & 8 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices}$$

Exercise 10. Should that the prisoner's dilemma bimatrix game defined by the following matrices

$$A = \underbrace{\begin{bmatrix} 2 & 30 \\ 0 & 8 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices} \qquad B = \underbrace{\begin{bmatrix} 2 & 0 \\ 30 & 8 \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices}$$

is a potential game in pure policies. □

Exercise 11. Consider a bimatrix with two actions for both players defined by the following matrices

$$A = \underbrace{\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices} \qquad B = \underbrace{\begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}}_{\text{P}_2 \text{ choices}} \Bigg\} \text{P}_1 \text{ choices.}$$

1. Under what conditions is this a potential game in mixed policies?

Your answer should be a set of equalities/inequalities that the a_{ij} and b_{ij} need to satisfy.

2. Find a potential function when the game is a potential game.

Your answer should be a function that depends on the a_{ij} and b_{ij} .

3. When is a zero-sum game a potential game in mixed policies? Find its potential function.

Your answer should be a set of equalities/inequalities that the a_{ij} and b_{ij} need to satisfy and the potential function should be a function that depends on the a_{ij} and b_{ij} . □