

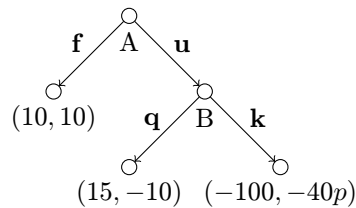
IA168 — Problem set 2

Throughout this problem set, “game” means “two-player extensive-form game with pure strategies only”.

Problem 1 [5 points]

Consider this real-life situation: Bob tells his wife Alice: “If you are ever unfaithful to me, I will kill you.” Then, Alice decides to be either **f**aithful or **u**nfaithful. If she is unfaithful, Bob eventually finds it out and either keeps **q**uiet or really **k**ills her and then, with probability p , is proved guilty and put in prison.

We model this scenario as the perfect-information game depicted below.



In dependence on the parameter p , $0 \leq p \leq 1$, answer the following questions:

How many strategies does each player have?

Which of them are never-best-response?

Which of them are maxmin?

How many strategy profiles are there?

Which of them are Nash equilibria?

Which of them are subgame-perfect equilibria?

Is Bob’s threat actually credible?

Problem 2 [7 points]

Find a perfect-information game where all of the following conditions are satisfied:

- there is a strategy profile whose outcome is for both players better than that of any Nash equilibrium;
- there is a Nash equilibrium whose outcome for player 1 is better than that of any subgame-perfect equilibrium;
- there are exactly two subgame-perfect equilibria s , s' , and the outcome of s is for both players better than that of s' .

Problem 3 [8 points]

For a strategy profile s of an imperfect-information game G , consider the following property (*):

For every information set I , there exists a node $h \in I$
such that s^h is a Nash equilibrium in G^h .

Prove or disprove the following two propositions: In every imperfect-information game where no path leads twice through the same information set, it holds that:

- every subgame-perfect equilibrium satisfies (*);
- every strategy profile which satisfies (*) is a subgame-perfect equilibrium.