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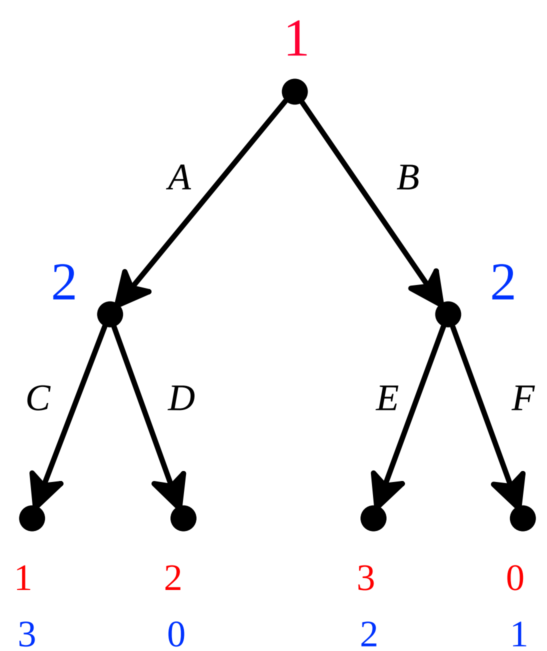
HOMEWORK 3 (for due date see the web page)

Consider perfect-information games.As you know, the notion of backward induction refines that of Nash equilibrium. Here we study a different refinement, let's call it a "defensible" Nash equilibrium (DNE for short). Fix a perfect-information game G and let V be the set of nodes that are on the play generated by *some* pure-strategy Nash equilibrium of G.

Definition. A pure-strategy profile s is a DNE if (1) it is a Nash equilibrium and (2) for every decision node n in the game, if there is a pure-strategy Nash equilibrium $\hat{s}$ whose associated play reaches node n (possibly different Nash equilibria for different nodes) and if i is the player who moves at n then the choice prescribed by s_i at n (where s_i is i's strategy in s) is the same as the choice prescribed by $\hat{s}_i$ at n (where $\hat{s}_i$ is i's strategy in $\hat{s}$).

We will consider several example.

EXAMPLE 1. Consider the following game:



(a) Find all the pure-strategy Nash equilibria.

(b) Find the backward-induction solution.

(c) Find the defensible Nash equilibrium. Explain why the other Nash equilibria are not DNE.
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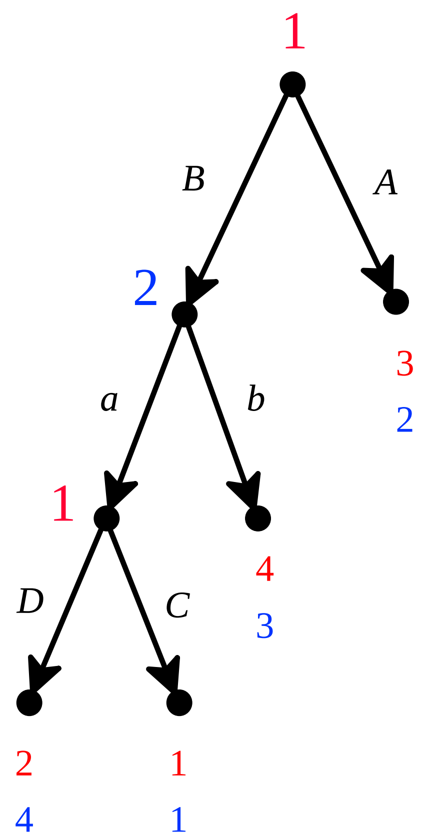
EXAMPLE 2. Now consider the following game:



(d) Find all the pure-strategy Nash equilibria.

(e) Find the pure-strategy backward-induction solution.

(f) Find the defensible Nash equilibrium. Explain why the other Nash equilibria are not DNE.

(g) **EXAMPLE 3.** Construct a two-player example where there are at least two DNE and not all DNE give rise to the same play.