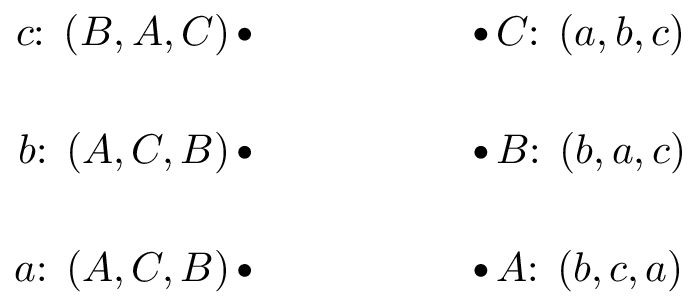
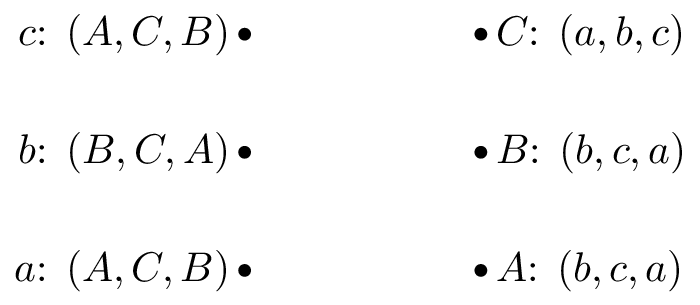
# Homework sheet 5 - Matching games, cooperative games and routing games

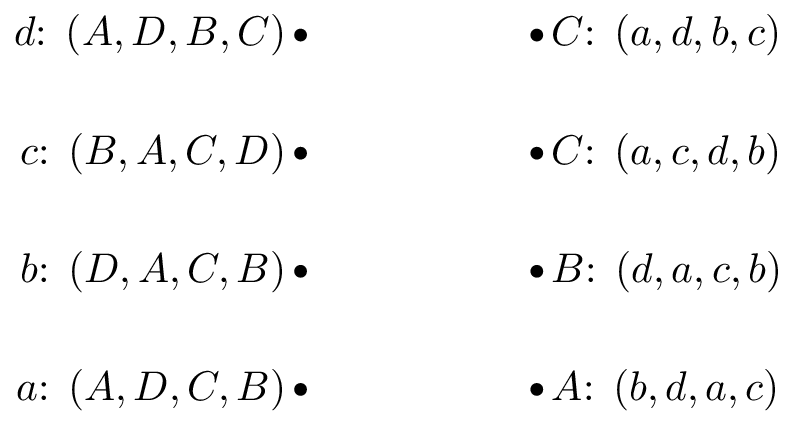
1. Obtain stable suitor optimal and reviewer optimal matchings for the matching games shown.



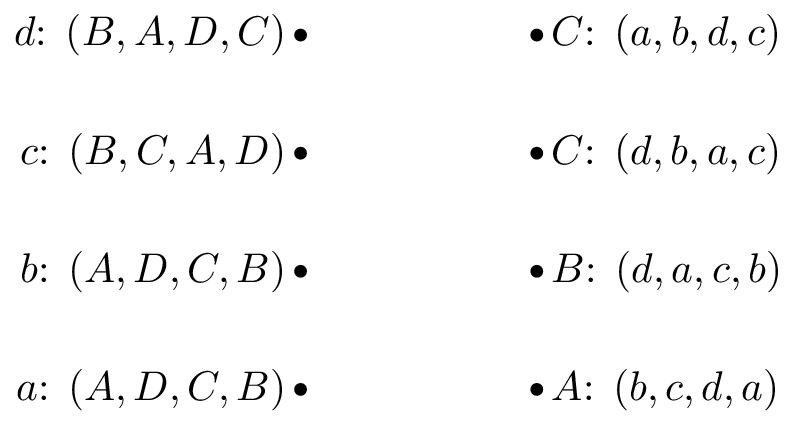
Matching game 1



Matching game 2



Matching game 3



Matching game 4

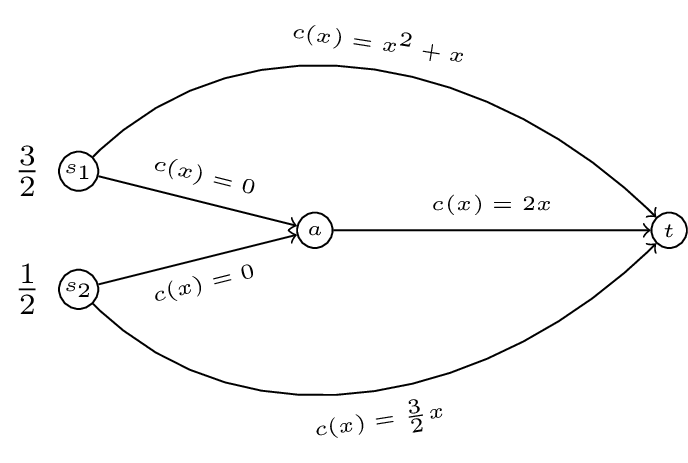
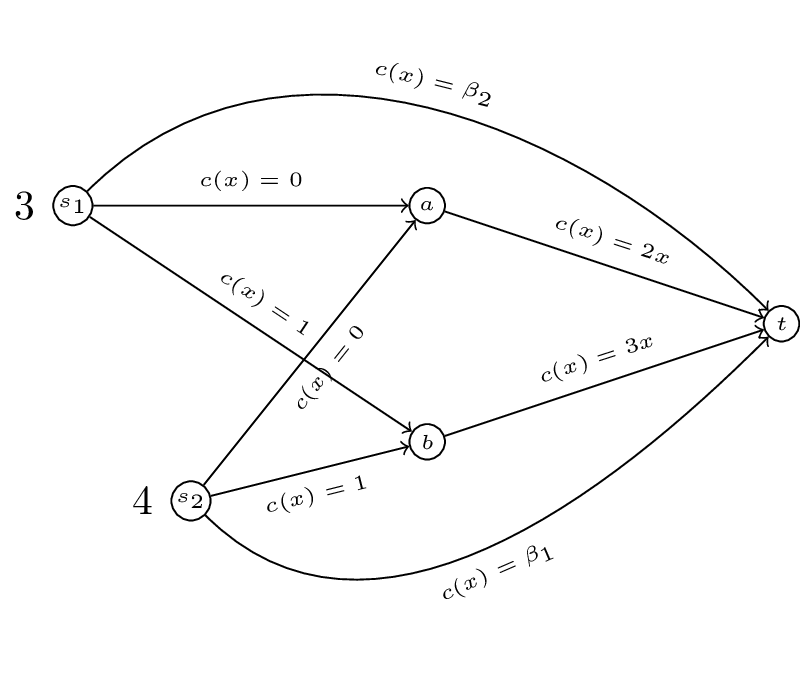
1. Consider a matching game where all reviewers have the same preference list. Prove that there is a single stable matching.
2. For the following cooperative games:
3. Verify if the game is monotonic.
4. Verify if the game is super additive.
5. Obtain the Shapley value.

1. Prove that the Shapley value has the following properties:

* Efficiency
* Null player
* Symmetry
* Additivity

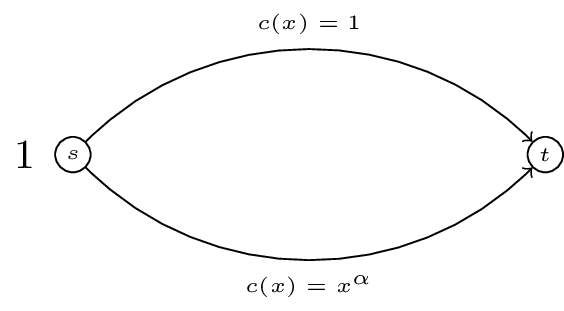
Note that this does not prove that the Shapley value is the only vector that has those properties (it in fact is though).

1. Calculate the Nash flow and the optimal flow for the routing games shown.

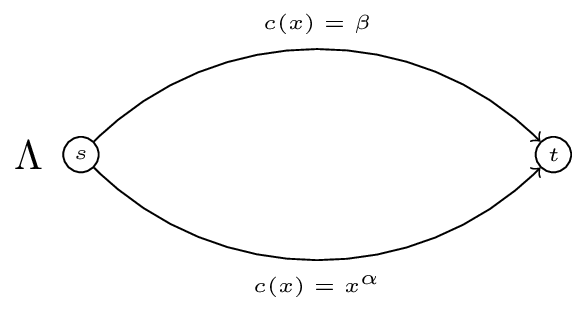
1. For a routing game the 'Price of Anarchy' is defined as:

For the game shown (a generalisation of "Pigou's example") obtain the PoA as a function of .



A generalization of Pigou's example

Now obtain the PoA for the game shown as a function of and . For what value of is the PoA at it's maximum?



A further generalization of Pigou's example