

# Game Theory Exam Topics, Autumn 2015

1. Combinatorial games,  $k$ -nim, Sprague–Grundy function, sums of games, Sprague–Grundy theory (Ferguson Part I, Sections 1–4 and 6).
2. Partisan games, numeric games, red-blue hackenbush (Fenner–Rogers, Section 2)
3. Top trading cycles algorithm, stable matchings, many-to-one matchings (Abdulkadiroğlu–Sönmez Sections 2 and 3.1.1)
4. Strategic games, domination, pure and mixed Nash equilibrium, iterated elimination. Proof of the Nash theorem using Kakutani’s fixed point theorem (Ferguson Part III Section 2, <http://isites.harvard.edu/fs/docs/icb.topic138342.files/lecture6.pdf>)
5. Maxmin strategies, von Neumann’s minimax theorem on two-player 0-sum games, correlated equilibrium, evolutionarily stable strategies (Ferguson Part III Section 1.5, Peres Sections 3.1, 3.2, 4.3, 4.7)
6. Cooperative games, spanning tree and spanning arborescence games, Shapley value, convex games (Ferguson Sections 1-3; Sections 2-4 in <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.362.7465&rep=rep1&type=pdf>)
7. Vickrey auction, Vickrey–Clarke–Groves mechanism, false-name-proofness, optimal auctions (Pritchard lectures 11-13; Section 6 in <http://arxiv.org/abs/cs/0202015>)

## List of online resources referred above:

- Thomas S. Ferguson, *Game Theory*, [http://www.math.ucla.edu/~tom/Game\\_Theory/Contents.html](http://www.math.ucla.edu/~tom/Game_Theory/Contents.html)
- Yuval Peres, *Game Theory, Alive*, <http://www.stat.berkeley.edu/users/peres/gtlect.pdf>
- David Pritchard, *Game Theory and Algorithms*, <http://ints.io/daveagp/gta/>
- Stephen A. Fenner, John Rogers, *Combinatorial Game Complexity: An Introduction with Poset Games*, <http://arxiv.org/abs/1505.07416>
- Atila Abdulkadiroğlu, Tayfun Sönmez, *Matching Markets: Theory and Practice*, <https://www2.bc.edu/~sonmezt/WorldCongressSurvey-June22-2011.pdf>

Note that these resources discuss several topics that we did not cover. You only have to learn the theorems that were mentioned in the lectures.