

CS 15-892 Foundations of Electronic Marketplaces

Homework 2

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Due November 5th in the beginning of class.

You may use any sources that you want. If you do so, you must cite the sources that you use. Teamwork is not allowed.

1. (30pts) Consider a private-values auction of one good when bidders have quasilinear utility functions and know their own valuations. Prove that bidding truthfully is a (weakly) dominant strategy in the Vickrey auction. [Prove this from first principles; do not use the fact that the Vickrey auction is a special case of the Groves mechanism.]
2. (40pts) Consider designing a mechanism (where participation is *ex post* individually rational) for the following setting. You have one company (*Profit & Gamble*) to sell. You don't care about keeping it or getting rid of it. There are two bidders with quasilinear utility functions. Bidder 1's valuation is drawn from a uniform distribution on $[0,1]$ (1 = one billion dollars). Bidder 2's valuation is independently drawn from a uniform distribution on $[1,4]$.
 - (a) Design a mechanism that uses take-it-or-leave-it offers (at most one offer to each bidder) and attempts to maximize revenue subject to that. What is your expected revenue in your mechanism? What is your worst-case revenue in your mechanism? Is your mechanism Pareto efficient? Justify your answer.
 - (b) What is the optimal (i.e., revenue-maximizing) auction for the setting? What is your expected revenue in that auction? What is your worst-case revenue in that auction? Is that auction Pareto efficient? Justify your answer.