# Game Theory, Fall 2024
# Problem Set 1

*Due on Sep 23 before class*

1. Consider the first/second price auction enviornment we covered in class. Instead of 2 bidders, assume there are $n$ bidders with value $v_1, \ldots, v_n$.

   (a) Extend the first price auction to this case. As usual, if more than one bidder bid the same highest price, a winning bidder is randomly drawn from them with equal probabilities. (Use this tie breaking rule also for the next question).

   (b) Extend the second price auction to this case.

2. ST Exercise 4.5.

3. ST Exercise 4.6.

4. ST Exercise 4.7.

5. ST Exercise 4.8.

6. Consider the following two-player game. Each player announces a nonnegative real number. The payoffs are

$$v_i(x_i, x_j) = \begin{cases} 2, & \text{if } x_i = 0, x_j = 1, \\ \arctan x_i, & \text{if otherwise.} \end{cases}$$

   (a) Argue that every positive announcement is strictly dominated.

   (b) Argue that announcement 0 is not strictly dominated.

   (c) From the above two questions, we know only 0 survives IESDS for both players. Are they mutual best responses?

7. Consider the $n$-firm Cournot competition. The demand curve is still

$$D(Q) = \max\{100 - Q, 0\}.$$

If each firm $i$ supplies $q_i$, the total supply is $\sum_{i=1}^{n} q_i$. Suppose each firm's marginal cost is 10.

(a) Write down its normal form game.

(b) For each firm, what are the strategies that survive IESDS?