

Assignment: Algorithmic Game Theory

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1. Let $f : \Theta \rightarrow \mathcal{X}$ be a social choice function such that we have the following for every $\theta \in \Theta$

$$\sum_{i=1}^n u_i(f(\theta), \theta_i) \geq \sum_{i=1}^n u_i(x, \theta_i) \quad \forall x \in \mathcal{X}$$

Show that f is ex-post efficient.

2. Consider the set of outcomes \mathcal{X} to be the set of integers in the range from 0 to 100. There are n players. The type of player i is θ_i and the utility of player i is $u_i(x) = -|x - \theta_i|$ for every $x \in \mathcal{X}$. Design n social choice functions $f_1, \dots, f_n : \times_{i \in [n]} \Theta_i \rightarrow \mathcal{X}$ each one of which is non-dictatorship as well as DSIC.