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- Surely this is just an outlier!!

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Arrow's Theorem: If there are three or more outcomes, these properties cannot simultaneously hold for any social preference function.

Mechanism Design

A mechanism specifies the actions available to each agent and the outcomes of each action profile.
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  If there is a mechanism with dominant strategies there is a equivalent mechanism where each player's dominant strategy is to be truthful (revelation principle).
- A mechanism should give the best outcome aggregated over all of the agents. A mechanism is economically efficient if the outcome chosen is one that maximizes the sum of the utilities of the agents.

Example: meeting scheduler

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Are these dominant-strategy truthful?

Alice, Bob, and Cory have to decide whether to meet on Monday, Tuesday, or Wednesday, with the following utilities for the meeting days:

	Monday	Tuesday	Wednesday
Alice	0	8	10
Bob	3	4	0
Cory	11	7	6

Should Alice be honest?

Gibbard–Satterthwaite theorem

Gibbard–Satterthwaite theorem as long as there are three or more outcomes, the only mechanisms with dominant strategies have a dictator: an agent whose preferences determine the outcome.

Vickrey–Clarke–Groves mechanism

- Introduce money, so that, for any two outcomes o_1 and o_2, for each agent there is some (possibly negative) amount d such that the agent is indifferent between the outcomes o_1 and $o_2 + d$.

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- VCG mechanism: Agents pay according to how much their participation affects the outcome.
- Agent i pays the sum of the value for the *other* agents if i had not participated minus the sum of the values for the other agents if i had participated.

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The VCG mechanism is both economically efficient and dominant-strategy truthful, assuming that agents only care about their utility and not about other agents' utilities or other agents' payments.

Example: meeting scheduler

VCG Mechanism:

	Monday	Tuesday	Wednesday	Payment	Net Value
Alice	0	8	10		
Bob	3	4	0		
Cory	11	7	6		
Total	14	19	16		

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  This is known as a second-price auction.
- This is equivalent (up to bidding increments) to having an ascending auction, where
  people specify how much they want to pay as a proxy bid;
  an agent converts proxy bids into real bids.