

Monotonicity: Boosting the winner should not change the result.  
 (they should still win)

IRV does not satisfy mono.

(example from last time)

	Mono.	Maj	CWC	Unanimity	IT A
Plurality	✓	✓	✗	✓	
Condorcet	✓	✓	✓	✓	
Borda	✓	✗	✗	✓	✗
IRV	✗	✓	✗	✓	
dictatorship	✓	✗	✗	✓	

Does plurality satisfy monotonicity? Yes,

since a plurality winner has the most 1<sup>st</sup> place votes, if we boost them, they will still have the most 1<sup>st</sup> place votes, so they still win.

Similar with Borda - boosting the winner gives them more points, so they still win.

Condorcet also satisfies monotonicity: If we have a Cond. winner & we boost them, then they still will win in any pairwise comparison, so they still win!

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A very simple criterion

Unanimity Criterion

If all voters prefer  $X$  above  $Y$ , then  $Y$  should not win.

[it doesn't mean  $X$  should win,  
since there may be another even better candidate]

Any system failing unanimity must be pretty bad

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Another Method

A bit stupid, like the number 0.

Dictatorship Before the election,

one of the voters is chosen to be the dictator.

Whoever the dictator ranks 1<sup>st</sup> wins.  
(all other votes are ignored)

Dictatorship does satisfy unanimity, since if all voters prefer X above Y, then the dictator prefers X above Y, so Y will not win.

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### Independence from Irrelevant Alternatives (IIA)

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About making "irrelevant" changes from the POV of the winner. These should not change the outcome.

Ex

	3	2
2	A	B
1	B	C
0	C	A

, use Borda.

$$A: 3 \cdot 2 + 2 \cdot 0 = 6$$

$$B: 3 \cdot 1 + 2 \cdot 2 = 7 \quad \leftarrow \text{B wins!}$$

$$C: 3 \cdot 0 + 2 \cdot 1 = 2$$

what if we change  $\begin{matrix} B \\ C \\ A \end{matrix}$  to  $\begin{matrix} B \\ A \\ C \end{matrix}$ ?

[This changes nobody's rank with respect to the winner (B). It's "irrelevant"]

The new result:

	<u>3</u>	<u>2</u>	
2	A	B	$A: 3 \cdot 2 + 2 \cdot 1 = 8$
1	B	A	$B: 3 \cdot 1 + 2 \cdot 2 = 7$
0	C	C	$C: 0 + 0 = 0$

A wins!

We didn't change B's ranking with respect to anyone else, but this changed the outcome!

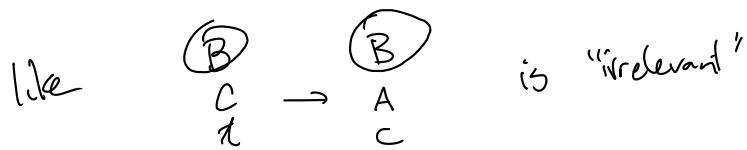
### Independence from Irrelevant Alternatives Criterion (IIA)

If there is a winner, and we change ballots without adjusting anyone's ranking relative to the winner, then the winner won't change.

our ex: B won, then unchanged  $\begin{matrix} B \\ C \\ A \end{matrix} \rightarrow \begin{matrix} B \\ A \\ C \end{matrix}$   
this was an "irrelevant" change.

Subtle point about the changes:

the IIA change must not modify any ranking relative to the winner.



but

The diagram shows two rankings separated by an arrow. The first ranking has A at the top, followed by B, and C at the bottom. The second ranking has C at the top, followed by B, and A at the bottom. Both rankings are enclosed in circles.

This change doesn't count as "irrelevant!"