

Math 1015
 Homework #3
 #3, 5, 6, 9

#3

Monotonicity means that if a voter decides to boost up a candidate on their ballot, then this will actually help that candidate - this is what should happen. The alternative would mean that in some cases it is bad for a voter to boost their favorite, which doesn't make any sense and will lead to lots of confusion.

#5

Please use this example election to show that plurality does not satisfy IIA:

	4	3	3	2
A	A	B	C	D
B	A	A	A	E
C	C	B	C	C
D	D	D	D	A
E	E	E	E	B

OG winner: A: 4
 B: 3
 C: 3
 D: 2
 E: 0

Change

D	C
E	E
C	D
<u>A</u>	<u>A</u>
B	B

this gives C 2 more votes, so C will become the winner, even though we didn't move anyone past A.

6
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Consider this election, using plurality:

	2	4	3
A	B	D	
C	A	A	
B	D	C	
D	C	B	

A: 2
B: 4
C: 0
D: 3

a) $\begin{matrix} D \\ A \\ C \\ \textcircled{B} \end{matrix}$ voters got their worst possible outcome. (B won)

If they instead voted $\begin{matrix} A \\ D \\ C \\ B \end{matrix}$, this makes A

win, which is preferable in their opinion.

b) For $\begin{matrix} A \\ C \\ \textcircled{B} \\ D \end{matrix}$ to get a better result, this would mean either A or C winning. They can't make A win, since they already put A on top and A still lost. They also can't make C win since moving C to the top would still have C lose. So no manipulation is possible.

119

Consider this election:

3	5	2
A	B	D
C	A	A
B	D	C
D	C	B

a It would look like:

	3	5	2
A	x	x	x
B		x	
C	x		
D			x

A: 10

B: 5

C: 3

D: 2

A wins

b

10 votes total, 3 have A on top,

so A would win with probability $\frac{3}{10} = 30\%$.

Similarly:

B	— — — — —	50%
C	— — — — —	0%
D	— — — — —	20%