Name: _____

Math 1015: Exam #1

Question 1. Please find the winner using plurality. Show enough work so that I can tell what you're doing.

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

plurality: A: 4
B: 2
C: 3

A wins!

Question 2. Please find the winner using ranked choice voting. Show enough work so that I can tell what you're doing.

4	2	3	1
A	B	D	C
B	C	B	A
C	A	A	D
D	D	C	B

Round 1

A: 4
B: 2
~~C: 1~~
D: 3

Round 2

4	2	3	1
A	B	D	A
B	A	B	D
D	D	A	B

A: 5
~~B: 2~~
D: 3

Round 3

4	2	3	1
A	A	D	A
D	D	A	D

A: 7
D: 3

A wins

Question 3. Please find the winner using Condorcet's method, or say that there is no winner.

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

A vs B: A: 4, B: 2+3=5

A vs C: A: 4, C: 2+3=5

B vs C: B: 4+2=6, C: 3

B wins!

Question 4. Please find the winner using the Borda count.

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

2
1
0

A: $4\times2 + 2\times0 + 3\times0 = 8$

B: $4\times1 + 2\times2 + 3\times1$

$4 + 4 + 3 = 11$

C: $4\times0 + 2\times1 + 3\times2$

$2 + 6 = 8$

B wins!

Question 5. Please explain why ranked choice voting satisfies the majority criterion.

Imagine a majority of voters rank X in 1st place. Then X will always have the most # of 1st place rankings in each RCV round, so X will never be eliminated.
Thus X wins the election using RCV.

Question 6. Please explain why Condorcet's method satisfies the unanimity criterion.

Imagine all voters rank X above Y.
Then X will beat Y in a 1 vs 1 matchup, so Y will not be the winner using Condorcet's method.

Question 7. Please use this example to explain why the Borda count does not satisfy the Condorcet Winner Criterion.

	3	4
2	A	B
1	C	A
0	B	C

Borda winner:

A: $3\times2 + 4\times1 = 10$

B: $3\times0 + 4\times2 = 8$

C: $3\times1 + 4\times0 = 3$

A wins with Borda.

Condorcet winner:

A v B: A: 3, B: 4

A v C: A: 3+4, C:

B v C: B: 4, C: 3

B is the Condorcet winner, but B loses with Borda.

So Borda does not satisfy CWC.

Question 8. Please explain why the plurality system satisfies monotonicity.

Imagine X wins with plurality, and then we boost X. Then X's amount of 1st-place rankings may increase, but nobody else's will increase, so X will still be the winner using plurality.

Question 9. Please use the following example to demonstrate that plurality does not satisfy IIA. (You don't need to write a proof.)

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

plurality: A: 3, B: 4, C: 2 — B wins!

But if

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

changes to

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

(this doesn't move anyone past the winner) then we get:

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

A: 5, B: 4, C: 0 — A wins!

Question 10. Use this sample election to show how some of the voters can manipulate the election if we're using Borda. Write some words explaining why your example qualifies as a manipulation.

6	3	2
A	C	B
C	A	C
B	B	A

OG result: A: 12 + 3 + 0 = 15, B: 0 + 0 + 4 = 4, C: 6 + 6 + 2 = 14 — A wins

The

B
C
A

voters get their worst outcome, so they will try to manip. by changing

B	C
C	B
A	A

Then we get:

6	3	2	
A	C	C	2
C	A	B	1
B	B	A	0

A: 15, B: 2, C: 6 + 6 + 4 = (16)

So C wins, which is a preferable outcome to the

B
C
A

voters.