Math 1116, Quiz #4, Fall 2013 Name KEY

Instructions: Answer each question as completely as possible. Show all work.

1. An election is held among 4 candidates A, B, C and D. The votes are summarized in the following preference table:

Number of voters	**11**	**5**	**7**	**7**	**3**	**4**
1st choice	A	A	B	C	D	C
2nd choice	D	D	A	D	B	D
3rd choice	B	C	D	B	A	A
4th choice	C	B	C	A	C	B

a. Determine the winner of the election using the Borda Count Method.

$A = 16(4) + 7(3) + 7(2) + 7(1) = 106$

$D = 3(4) + 27(3) + 7(2) = 107$ ⟵ D wins

$B = 7(4) + 3(3) + 18(2) + 9(1) = 82$

$C = 11(4) + 5(2) + 21(1) = 75$

b. Rank the candidates using the extended Borda Count Method.

1st = D   3rd = B

2nd = A   4th = C

c. Does this election violate any of the fairness criteria covered in this course? If so, which one(s)? Explain your answer.

No monotonicity - no second vote to compare with

Majority: $11 + 5 + 14 + 7 = 16 + 21 = 37$ $37/2 = 18.5 \Rightarrow 19$

$A = 16$, $B = 7$, $C = 11$, $D = 3$ no majority violation

Condorcet: $A = 111$ $C =$ A wins $\Rightarrow$ Condorcet violation

$B = 1$ $D = 11$

IIA: remove C

$A = 16(3) + 7(2) + 4(2) + 10(1) = 74$

$B = 11(1) + 5(1) + 7(3) + 7(1) + 3(2) + 4(1) = 54$

$D = 11(2) + 5(2) + 7(1) + 7(3) + 3(3) + 4(3) = 81$

remove B:

$A = 11(3) + 5(3) + 7(3) + 7(1) + 3(1) + 4(1) = 83$

$C = 11(1) + 5(1) + 7(1) + 7(3) + 3(1) + 4(3) = 59$

$D = 11(2) + 5(2) + 7(2) + 7(2) + 3(3) + 4(2) = 77$

IIA violated if B drops out.

2. Given the weighted voting system [18: 12, 9, 6, 3], find the Banzhaf power distribution.

{P1, P2, P3, P4}

{P1, P2, P3}

{P1, P2, P4}

{P1, P3, P4}

{P2, P3, P4}

{P1, P2}

{P1, P3}

Critical players = 12.

$A = \frac{5}{12} = 42\%$

$B = \frac{3}{12} = 25\%$

$C = \frac{3}{12} = 25\%$

$D = \frac{1}{12} = 8\%$