

MAT 112 Intro to Contemporary Mathematics Josh Stangle
Spring 2018

TEST 1

Your Name (please PRINT): _____

=====INSTRUCTIONS=====

- Fill in the above items.
- There is a total of 5 problems, for a maximum possible total value of 55 points. **Make sure you have all 6 test pages (this cover page + 5 test pages).** You are responsible to check that your test booklet has all 6 pages. Alert a proctor if your copy is missing any pages.
- **Show all your work.** Only minimal credit will be given for answers without supporting work.
- **Write your answer in the box** at the bottom of pages 2-6.
- **Use the back of test pages if additional space is needed,** and for scratch paper.
- You may use scientific or standard calculators. No graphing calculators are allowed.

Do not write below this line

Pb. #	Max Points	Your Score
1	10	
2	10	
3	10	
4	10	
5	15	
Total	(55)	

1. Define or explain the following terms:

1. Majority Candidate

2. Arrow's Impossibility Theorem

3. Monotonicity Criterion

4. Veto Power

5. Pivotal Player

2. Consider the following preference schedule in a Preference ballot vote:

	14	12	8	2	1
1	A	B	C	B	C
2	B	D	A	C	A
3	C	C	B	D	B
4	D	A	D	A	D

Find any two counting methods which produce different winners. Show the outcome of the method you choose.

3. Given the following weighted voting system with players A,B,C, and D, find the Banzhaf power distribution:

$$[18; 12, 9, 5, 4].$$

4. A business is run by 6 partners. The senior partner (say Partner 1) only needs the support of two others to win. If 4 of the the 5 junior partners vote together, however, they win without the senior partner. Find the Shapley-Shubik Power Distribution for the 6 partners. Hint: Writing out all possible 720 sequential coalitions is a bad plan.

5. (a) Show that for the following preference ballot the Borda count method violates the Majority Criterion:

	9	3	2	2	1
1	A	B	B	D	C
2	B	D	C	C	D
3	C	C	D	B	B
4	D	A	A	A	A

(b) Find a Modified Borda Count (recall this means you can assign points to the rankings differently) under which the above ballot will satisfy the Majority Criterion.