

Math 118 — Useful information concerning Midterm #1

The test will be a 60-minute in-class exam held on Monday, October 7. You may **not** use any notes or books. Please come to class a few minutes early, so that you don't forfeit any of your 60 minutes.

Make up tests will be allowed **only** if pre-arranged. If you are sick, please email or call me in my office (632-8358) **BEFORE** the test.

The exam will cover all of Chapter 1 and most of Chapter 3.

The following is a partial list of concepts and "skills" you may need during the exam:

- Be able to explain how each of the following voting systems works: **Plurality**, **Runoff**, **Borda's Method** and **Approval Voting**. Be able to explain the advantages and disadvantages of each system.
- Be able to explain what a **Condorcet winner** means. Understand that not every election has a Condorcet winner!
- Given a table of **preference rankings**, be able to figure out which candidate would win each type of election, and which candidate (if any) is a Condorcet winner.
- Understand what it means for preference rankings to be **single-peaked**, with respect to a given ordering of the candidates. Given a table of preference rankings, you should be able to quickly determine whether they are single-peaked.
- Know **Duncan Black's Theorem**: "Any election in which the preference rankings are single-peaked (with respect to some ordering of the candidates) has a Condorcet winner."
- Be able to explain what **Pareto optimality** and **independence from irrelevant alternatives** mean. Know which of the voting systems we've studied (plurality, runoff, Borda) satisfies each of these properties. Give an example of a voting system that does not satisfy the Pareto optimality property.

- Know **Arrow's Impossibility Theorem**: Other than a dictatorship, no voting system based on preference rankings satisfies both the Pareto optimality and the independence from irrelevant alternatives properties.
- Know basic properties of **logarithms**. Use logarithms to solve equations like $5^t=20$, etc.
- Understand that **simple interest** means that interest is paid only on the amount originally deposited, which is called the **principal**, or **present value**. With simple interest, the **future value** is calculated by the formula $F=P(1+rt)$.
- Understand that in a **compound interest** account, interest is compounded at regular intervals, and is paid on the principal as well as on all previous interests payments credited to the account. If the annual interest rate is r and interest is compounded n times per year, then the **periodic interest rate** is r/n , and the future value of the account is given by the formula $F=P(1+r/n)^{nt}$ where t is the number of years that you wait.
- Know that the **APY** (Annual Percentage Yield) of an account is the actual percentage by which your balance increases each year, which depends on the annual interest rate and on the frequency of compounding. You may compare two investments by comparing their APYs. Know and understand the formula $APY = (1+r/n)^n - 1$.
- You do not need to memorize the **Systematic Savings Plan Formula** (pg 155), although if you are given the formula on the exam, you should know what each of the letters stands for (F, D, r, n, t), and you should be able to use the formula to solve problems similar to your homework problems. Also, understand that the formula tells you what answer you would get if you added up the first deposit plus the interest it earns plus the second deposit plus the interest it earns, etc.
- Know that an **amortized loan** is a loan that is paid back with equal payments at regular intervals. The lender uses the **Loan Formula** (pg 164) to calculate the dollar amount of each payment. You do not need to memorize the loan formula, but if you are given the formula on the exam, you should know what each of the letters stands for (F, R, r, n, t), and you should be able to use the formula to solve problems similar to the homework problems.
- Understand that the loan formula contrives the amount of each payment so that, if the lender were to deposit the payment checks as he received them, the amount in this account when the loan is finally paid off (as calculated by the systematic savings plan formula) equals the amount he could have made by investing the entire amount of the loan in the first place.
- Know that the **loan balance** of an amortized loan is the amount that one would need in order to pay off the entire loan today. Said differently, the loan balance is the principal that one would have to borrow today in order to yield the series

of payments remaining to be paid.