

**Math 183 Fall 2004 Final Exam**

Name: \_\_\_\_\_  
(Please Print.)

Student ID #: \_\_\_\_ - \_\_\_\_ - \_\_\_\_.

Do all your work on this exam. Include the main steps of your solutions and state how you used your calculator.

**Part I - Probability**

1. Ruth Rose owns five pairs of pants, five shirts and five hats. For each type of garment, she has one in each of the colors blue, red, green, brown and lavender. How many different ways can she wear one of each item of clothing, if she wants her hat and pants to be of different colors?

| Problem | Points | Score |
|---------|--------|-------|
| 1       | 8      |       |
| 2       | 8      |       |
| 3       | 8      |       |
| 4       | 8      |       |
| 5       | 8      |       |
| 6       | 8      |       |
| 7       | 8      |       |
| 8       | 8      |       |
| 9       | 8      |       |
| Total   | 72     |       |

2. Jane plays a game where she tosses three coins and wins \$8 if three heads appear, \$4 if two heads appear and \$2 if one head appears. If no heads appear she does not win anything.
- (a) Make up a probability distribution for her winnings.
- (b) What is the expected value of her winnings?
3. For his Hungarian Goulash, Oliver likes to use a red pepper. Of the 5 peppers available, 3 are rotten. He picks peppers one at a time, until he gets a good one, or has chosen two rotten ones. If both are rotten, he gives up and does without a pepper.
- (a) Draw a tree diagram summarizing this information and label it with the appropriate probabilities.
- (b) Given that he puts a pepper in his goulash, what is the probability that he picked the pepper with his second attempt?

## Part II - Math of Finance

4. Mary makes a deposit in an account paying 8% per annum compounded monthly. After 5 years the interest rate drops to 6%, still compounded monthly. Twenty years after her initial deposit, the balance in the account is \$44,788.70. How much was her initial deposit?
5. As Junior heads off to college, Mom and Dad deposit a sum in a bank account paying 4% interest compounded monthly. The balance is enough to allow Junior to withdraw \$100 at the end of each month during his four years in college.
- (a) How much did Mom and Dad deposit?
- (b) Since Junior suspects that it will take him five years to graduate, he decides to make withdrawals spread over 5 years instead of 4. How much can he withdraw each month for the five years?

6. (a) Bart borrows \$10,000 to start his surfboard business. He pays an annual interest rate of 6% compounded monthly and makes a payment of \$100 at the end of each month. Write down a difference equation giving the balance on the loan after  $n$  months.
- (b) Make a table giving the balance on the loan at the end of each year for the first 6 years.

**Part - III Linear algebra.**

7. Find all solutions to each of the following systems of equations.

$$x + 2y + 3z = 1$$

(a)  $2x + 5y + 4z = 5$

$$3x + 7y + 7z = 5$$

$$x + 3y + 2z = 3$$

(b)  $2x + 8y - 2z = 0$

$$2x + 7y + z = 3$$

8. A political candidate has \$8.8m to spend on advertising on television, in newspapers and on radio. He decides to spend \$2m more on television than on newspapers and radio combined. The amount spent on newspapers is \$0.4m less than twice the amount spent on radio.

(a) Write a system of 3 linear equations in 3 variables to describe the above situation.

(b) How much did he spend on each type of advertising?

9. An economy consists of three industries: agriculture, steel and coal. The agriculture industry consumes \$.05 of agriculture, \$.03 of steel and \$.11 of coal to produce \$1 of coal. The steel industry consumes \$.02 of agriculture, \$.30 of steel and \$.18 of coal to produce \$1 of steel. The coal industry consumes \$.04 of agriculture, \$.10 of steel and \$.13 of coal to produce \$1 of coal.

(a) What is the input-output matrix for this economy?

(b) At what level should each industry set production in order to meet a consumer demand for \$1.2b of agriculture, \$5b of steel and \$3.2b of coal?