

Math 210

Final Exam

Dr. Chandarana

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Name:

ID #:

Teaching Assistant (Circle one) Konstantina Christodouloupoulou Leon Chen

Discussion Section Time and Day:

Note: For full credit show all work and proper reasoning clearly. *There will be very little or no credit for answers given without showing an appropriate amount of work. Cross out or erase any material you do not want counted. Incorrect reasoning will count against you. You may use a scientific calculator but neither a graphing calculator nor a programmable calculator.*

There are nine (9) pages (including this page) on this exam and an extra sheet for scratch work. Do not miss any pages by mistake. After finishing the exam, hand in your exam to your TA.

Good Luck!

<i>problem</i>	<i>points</i>	<i>your score</i>
1	10	
2	15	
3	10	
4	15	
5	10	
6	10	
7	10	
8	20	
<i>total</i>	100	

1. (10 points) Three TV networks compete for viewers for any given time slot. Suppose that their 8pm programs are NatureShow, Sitcom and Drama. A survey of viewers indicates that of those watching NatureShow one week, 50% will continue watching NatureShow in the next week, and 50% will switch to Sitcom. For those watching Sitcom, $\frac{2}{3}$ will continue watching Sitcom and $\frac{1}{3}$ will switch to Drama. Of those watching Drama, 75% will continue watching Drama, and 25% will switch to NatureShow. Formulate this situation as a Markov chain and find the transition matrix.

If initially on Friday the 13th, 15% are watching NatureShow, 40% are watching Sitcom, and 45% are watching Drama, what percentage of people will be watching these programs on Friday the 20th? Round your answer to the nearest percent.

2. (15 points)

- (a) Decide whether the Markov chain in Question 1 is regular.
- (b) If the Markov chain is regular, in the long run, what fraction of the viewers in Question 1 will be watching NatureShow, Sitcom and Drama?

3. (*10 points*) From a standard deck of 52 playing cards, a collection of 7 cards is picked. Assuming that each collection of 7 cards is equally likely to be chosen, what is the probability that exactly 3 hearts are among the 7 cards?

4. (15 points) Three hundred students are asked whether they are taking Math, Physics or Chemistry. Equal number of students are taking Math and Physics and twice as many are taking Chemistry as are taking Math; 43 are taking all three; 73 are taking both Chemistry and Physics; 70 are taking both Math and Physics; 60 are taking both Math and Chemistry.

- (a) How many are taking Chemistry?
- (b) How many are taking Math only?

5. (10 points) Out of the 300 students in Question 4, a student is picked at random.

- (a) What is the probability that the student is taking exactly two of the three subjects?
- (b) What is the probability that the student is taking Math or Chemistry but not Physics?
- (c) What is the probability that the student is taking exactly one of the subjects?

6. (10 points) Using matrices and row operations, solve the following system of equations. Show all row operations.

$$\begin{aligned}x - y + z &= 3 \\x - 2y + 3z &= 3 \\2x - 3y + 5z &= 5\end{aligned}$$

7. (10 points) A license plate consists of four not necessarily distinct numbers from the set $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ followed by three distinct letters from the set of all letters $\{A, B, C, \dots, X, Y, Z\}$ of the alphabet. A license plate is picked at random. Find the probability that it has all distinct *numbers*.

8. (20 points) You buy a house for \$210,000 and make a down payment of \$35,000 on December 1, 2003. You pay off the rest of the balance by making equal payments on the first day of each month starting January 1, 2004 for 17 years. The rate of interest is 7% compounded monthly.

- (a) What are your monthly payments?
- (b) How much money do you end up paying at the end of 17 years?
- (c) How much interest do you pay?
- (d) Out of the first payment, how much is applied towards the interest and how much is applied towards the principal?

