MATH 312 Finite Math
Review for Exam II

1. Use the simplex method to maximize $P = -5x + 3y - z$ subject to the constraints $-2x + y + 2z \leq 30$, $-3x + 2y \leq 70$, $x + y + z \leq 100$, $x \geq 0, y \geq 0, z \geq 0$.

2. Minimize $C = 10x + 30y$ subject to the inequalities $x + 3y \geq 2$, $5x - y \geq 1$, $x \geq 0$, $y \geq 0$. Set up the initial simplex tableau and pivot to remove the negative elements from the last column. Use the simplex method to minimize C.

3. The linear programming problem *Maximize* $P = x + 2y + z$ *subject to the constraints* $x - y + 2z \leq 10$, $2x + y + 3z \leq 12$, $x \geq 0$, $y \geq 0$, $z \geq 0$, has initial and final simplex tableaux

$$\left[\begin{array}{cccccc|c} 1 & -1 & 2 & 1 & 0 & 0 & 10 \\ 2 & 1 & 3 & 0 & 1 & 0 & 12 \\ \hline -1 & -2 & -1 & 0 & 0 & 1 & 0 \end{array}\right] \qquad \left[\begin{array}{cccccc|c} 3 & 0 & 5 & 1 & 1 & 0 & 22 \\ 2 & 1 & 3 & 0 & 1 & 0 & 12 \\ \hline 3 & 0 & 5 & 0 & 2 & 1 & 24 \end{array}\right]$$

Suppose that the inequalities are replaced by $x - y + 2z \leq 7$, $2x + y + 3z \leq 14$. Use marginal analysis to find the last column of the new final tableau and the new maximum value.

4.(a)Shade the region on the Venn diagram corresponding to $(A' \cup C) \cap (B \cap A)'$.
(b) Is it always true that $A \cap B \subseteq (B - C) \cup (C - A)$?

5. 275 shoppers are asked whether they have ever bought product A, B or C. Suppose that 133 had bought A, 82 had bought B, 70 had bought C, 31 had bought A and C, 30 had bought B and C, 20 had bought A and B, and 53 had bought none of the three.
(a) How many bought all three?
(b) How many bought just one of the three?

6. A Christmas decoration has four red lightbulbs and three green lightbulbs. If one or more bulbs are faulty the decoration won't functon. If the probability of a faulty red bulb is 1% and of a faulty green bulb is 2%, what is the probability that:
(a) All the bulbs are faulty?
(b) The decoration won't function?

7. A company buys 70% brand A lightbulbs and the rest brand B light bulbs. Suppose that the probability of a brand A bulb being faulty is 2% and the probability of a faulty brand B bulb is 5%. A bulb is chosen at random and tested.
(a) Draw a tree diagram for this experiment.
(b) What is the probability that a faulty brand A bulb was picked?
(c) What is the probability that the bulb was faulty?
(d) If the bulb was defective what is the probability that it was a brand B bulb?

8. A group are asked whether they have been to Paris or Rome. Suppose that 50% have been to Paris and 30% to Rome. If 20% have visited both, what is the probability that:
(a) A person in the group who has visited Rome has also visited Paris?
(b) A person in the group who has visited Paris has also visited Rome?
(c) A person in the group has visited neither of these cities?

9. $\mathcal{U} = \{\text{Students}\}$, $A = \{\text{Men}\}$, $B = \{\text{Students taking Math 312}\}$, $C = \{\text{Students who skip class on Friday}\}$.
(a) Describe the set $(A' \cap C)' \cap B$ in words.
(b) Using set theoretic notation describe the collection consisting of men who are not taking Math 312 and women who are taking Math 312.

10. (a) In the expansion of $(x + y + z)^7$ what is the coefficient of $x^3y^2z^2$?
(b) In the expansion of $(2x - 3z)^7$ what is the coefficient of x^5z^2? of x^4z^4?
(c) What does $\sum_{j=0}^{n} \binom{n}{j} 9^j$ equal?

11. A committee of 5 is randomly chose from a group of 15 women and 10 men. What is the probability that the committee contains
(a) no men?
(b) 2 men and 3 women?
(c) at least one man?
(d) Are the events 'contains at least one man' and 'contains at least one woman' independent?

12. A die is rolled 7 times. What is the probability of rolling:
(a) three threes and four fours?
(b) three threes?
(c) three or more threes?

13. A company has ten applicants to fill five positions. Assuming a person can be offered only one job, how many ways can it fill the jobs if they consist of
(a) one in sales, one in research, one in accounts, one in marketing and one in management.
(b) 3 in accounts and 2 in sales.
(c) as in (a) or (b) but only 4 of the applicants are qualified to work in accounts.

14. Four people each choose a number from 1 to 6. What is the probability that at least two of them chose the same number?