Name (Please Print) ____________________

Finite Applications of Math - MATH 312
Final Exam
Spring 1999

Show <u>all</u> work. No notes, books, reference material are allowed.
Correct answers without supporting work will receive no credit.

**(7)** 1.a) When does a graph have an Euler circuit?

**(17)** b) Find an Euler circuit of the following graph:

**(17)** 2. Find a minimal spanning tree for the following weighted graph:

**(16)** 3. Construct a truth table for the statement: $\sim (p \vee q) \wedge \sim p$.

**(16)** 4. Show that $\quad (p \rightarrow q) \Leftrightarrow \sim (p \wedge \sim q)$.

**(16)** 5. Wildcat Pizza offers four toppings: chocolate chip, licorice, butterscotch, and applesauce. One night 300 pizzas were ordered. 60 had exactly two toppings, 50 had exactly three toppings, 20 had all four toppings and 80 had no toppings. How many pizzas had one topping?

**(16)** 6. Use the fact that $\begin{bmatrix} -2 & 2 & -1 \\ 3 & -5 & 4 \\ 5 & -6 & 4 \end{bmatrix}^{-1} = \begin{bmatrix} 4 & -2 & 3 \\ 8 & -3 & 5 \\ 7 & -2 & 4 \end{bmatrix}$

to solve the system

$$\begin{aligned} -2x + 2y - z &= 5 \\ 3x - 5x + 4z &= -6 \\ 5x - 6x + 4z &= 7 \end{aligned}$$

You <u>must</u> use the inverse.

**(14)** 7. Use the simplex method to maximize $2x + 3y$ subject to:

$$\begin{aligned} 5x + 3y &\leq 30 \\ 3x + 2y &\leq 60 \\ x + y &\leq 50 \\ x, y &\geq 0 \end{aligned}$$

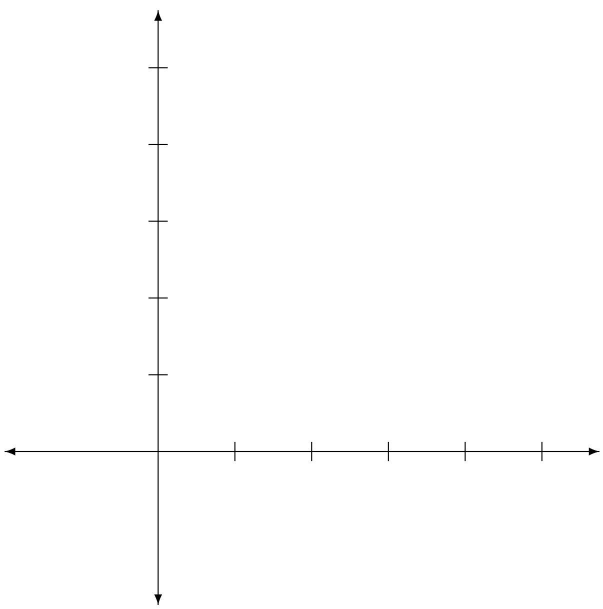
**(14)** 8. A club has 12 women and 10 men. In how many ways can 2 rows, one of 5 women and one of 6 men, be chosen.

**(12)** 9.a) A class of 21 students has 12 seniors and 9 juniors. What is the probability that a group of 4 students chosen at random from the class has no seniors?

**(12)** b) Given that the group in part a) has 3 juniors, what is the probability that it has no seniors?

**(12)** 10. A set, $S$, has 16 elements. How many subsets of $S$ have at least three elements?

**(14)** 11. Find the **maximum** and the **minimum** of $z = 4x+3y$ subject to the constraints below. You must solve the problem graphically. This includes graphing and <u>computing</u> the vertices of the region of feasibility.



$$\begin{aligned} 2x + y &\leq 5 \\ -3x + y &\geq 1 \\ -x + 3y &\leq 3 \\ x \geq 0, y &\geq 0 \end{aligned}$$

**(10)** 12. Find the inverse of the matrix $\begin{bmatrix} 4 & -7 \\ -5 & 9 \end{bmatrix}$.

**(7)** 13. Write the contrapositive of the statement: *If John is good, then John gets ice cream.*