1. Use a properly labeled Venn diagram to determine the validity of the following argument. Explain. *(9 points)*

> 1. All nurses are caring.
> 2. Jill is caring.
> _____
> Therefore Jill is a nurse.

2. Convert the following argument into symbolic form and determine if the argument is valid using a truth table. *(10 points)*

> If math is interesting, then I'll get an A. If I study well, then I'll get an A. I get an A. Therefore, I studied well or math is interesting.

3. Write the contrapositive of the statement "If I get an A or a B then I will be happy." *(8 points)*

4. If $U = \{1,2,3,4,5,6,7,8,9,10,11,12,13,14\}$, $A = \{1,3,5,7,9\}$ and $B = \{1,2,3,4,5,6\}$, find the set $A \cap B$; then find $(A' \cup B')'$. *(9 points)*

5. How many subsets are there of a set having 8 elements? Explain how the answer is related to the number of ways a hamburger can be served if there are 8 different condiments for the customer to choose from. *(9 points)*

6. In a dorm holding 1000 students, 500 are taking math, 300 are taking biology, and 200 are taking a foreign language. Suppose 25 are taking all three, 75 are taking math and biology, 50 are taking only a foreign language, and 65 are taking math and a foreign language. What percentage of students in the dorm are taking at least one of these three subjects?

   Draw and label a Venn diagram and explain your reasoning. *(10 points)*

7. Compute the numbers $_8P_5$ and $_8C_5$. Explain these numbers would be used in a counting argument. *(9 points)*

8. In how many ways can teams in a 10-team league finish first, second, and third (assuming no ties). Explain your counting argument. *(9 points)*

9. From a group of 7 men and 8 women, how many different ways are there to choose a 5-person committee consisting of 3 women and 2 men? Explain your counting argument. *(9 points)*

10. How many different 5-card poker hands are a flush (i.e., all cards in the same suit)? *(9 points)*

11. What is the probability of rolling a total of 8 on two rolls of a die? Explain you reasoning. *(9 points)*