1. Write the **negation** of the following propositions. (15 pts)

   (a) Mary like hiking and swimming.

   (b) Not every student likes Mathematics.

   (c) If it rains today, then I will drive to work.

2. Find the truth table for $(p \vee q) \to (\neg p \wedge q)$. Show details. (10 pts)

3. Given subsets A = {1, 3, 6, 7, 8} and B = {4, 6, 8, 9} of {1, 2, …, 10}, find　　(16 pts)

   (a) the complement of A;　(b) A∪B;　(c) A∩B;　(d) A ⊕ B.

4. Given $f(x) = x^2 + 1$ and $g(x) = 3x - 8$, (a) find the inverse of g(x); (b) explain why f(x) is not invertible;

   (c) evaluate f(3), g(3), f ∘ g (3). (4 + 4 + 6 = 14 pts)

5. Prove by **induction**: $1 \cdot 2 + 2 \cdot 3 + \cdots + n(n+1) = n(n+1)(n+2)/3$　　for every positive integer n.
(12 pts)

6. Find the number of permutations of the letters ABCDEFG contains (a) the string BCD; (b) the strings BA and GF; (c) the strings ABC and CDE. Show details.　(15 pts)

7. Suppose that A and B are events from a sample space ={ 1, …, 12} with probabilities P(A) = 2/3 and

   P(B) = 1/2. (a) What is the largest P(A∪B) can be? Give an example on A and B to support your answer.
   (b) What is the smallest it can be? Give an example on A and B to support your answer. (12 pts)

8. In which order are the vertices of the ordered rooted tree below visited using an **inorder** traversal?
   (6 pts)