Latihan Soal UTS (Tutoring Discrete Math)

1. What rule of inference is used in this arguments?
    a. Alice is a mathematics major. Therefore, Alice is either a mathematics major or a computer science major.
    b. If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.

2. For each of these collections of premises, what relevant conclusion or conclusions can be drawn?
    a. “If I take the day off, it either rains or snows.” “I took Tuesday off or I took Thursday off.” “It was sunny on Tuesday.” “It did not snow on Thursday.”
    b. “I am either clever or lucky.” “I am not lucky.” “If I am lucky, then I will win the lottery.”

3. P(x) represents “x is a prime numer”, what is the truth value for VxP(x) where the domain is all integers.

4. Determine the truth value of each of these statements if the domain for all variables consists of all integers.
    a. ∀n∃m(n + m = 0)
    b. ∃n∀m(nm = m)

5. Prove that
    a. $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$
    b. $1 + 3 + 5 + \cdots + (2n - 1) = n^2$

6. Determine whether the function f : Z × Z → Z is onto if
    a. $f(m, n) = m + n$
    b. $f(m, n) = m^2 + n^2$
    c. $f(m, n) = m$
    d. $f(m, n) = |n|$.
    e. $f(m, n) = m - n$

7. Fuzzy Set

$$\mu_A(x) = \begin{cases} 0, & x \leq 3 \\ \frac{x-3}{2}, & 3 < x \leq 5 \\ \frac{8-x}{3}, & 5 < x \leq 8 \\ 0, & x > 8 \end{cases}$$

$$\mu_B(x) = \begin{cases} 0, & x \leq 4 \\ x - 4, & 4 < x \leq 5 \\ 1, & 5 < x \leq 6 \\ \frac{10-x}{4}, & 6 < x \leq 10 \\ 0, & x > 10 \end{cases}$$

Draw $A \cup B$, $A \cap B$, A', B', $A' \cup B'$, $A' \cap B'$, $\text{supp}(A)$, $\text{supp}(B)$, $A_{0.5}$, $B_{0.5}$

8. Express the greatest common divisor of each of these pairs of integers as a linear combination of these integers.
   a. 117, 223
   b. 123, 2347
   c. 2002, 2339

9. Find a div m and a mod m when
   a. a = 228, m = 119
   b. a = 9009, m = 223
   c. a = −10101, m = 333
   d. a = −765432, m = 38271