Wolkite University
Mathematics Department
Basic Mathematics for NS
Assignment-1

1. If $\neg[\neg r \implies \neg(p \vee q)]$ is true, then find the truth value of $[(p \iff r) \vee q] \iff (\neg p \wedge r)$.

2. For the following propositions, determine its logical nature (tautology, contradiction, or contingency) and provide a truth table to justify your answer.

   1. $[p \wedge (p \implies q)] \implies q$
   2. $(\neg q \implies \neg p) \implies ((\neg q \implies p) \implies q)$

3. Investigate the validity of the following arguments:

   1. "If the team is late, then it cannot play the game. If the refree is here, then the team can play the game. The team is late. Therefore, the refree is not here"
   2. $P \implies Q$, $(Q \implies R) \implies P$. Therefore, R.

4. Find the truth values of the following where $U = \mathbf{R}$

   a) $(\forall x)(\exists y)(x^2 - y^2 = (x-y)(x+y))$
   b) $(\exists x)(\forall y)(x^2 < y^2)$
   c) $(\forall x)(\exists y)(xy = 4)$

5. If $n(A \setminus B) = 18, n(A \cup B) = 70$ and $n(A \cap B) = 25$, then find $n(B)$.

6. Determine the greatest common factor (GCF) and least common multiple (LCM) of the numbers 18, 72, 108, and 252.

7. Prove the following statements using mathematical induction for all $n \in \mathbb{N}$:

   a) $3^n > n^2$
   b) $n^3 + 2$ is divisible by 3.

8. Among a group of students, 50 played basketball, 50 played volleyball and 40 played football. 15 played both basketball and volleyball, 20 played both volleyball and foot ball, 15 played basketball and football and 10 played all three. If every student played at least one game, find the number of students who played only basketball, only volleyball and only football.

9. Find the square roots of $z = 1 + 4i\sqrt{3}$ using its polar form.

10. Solve the equation $z^{\frac{3}{2}} - 4i = 0$.