

Algebra Guided Exercises -- Academic Year 2025/2026

Elements of Logic – Part1

Series 1

Exercise1 :

Let P and Q be two propositions. We consider the logical connectives

and: $\wedge$ or: $\vee$ implies: $\Rightarrow$ negation: not

Build a truth table giving the truth value of :

- 1- $Q \Rightarrow (\text{not}(\text{not}(P \text{ or } Q)) \text{ and } (P \text{ or } Q))$
- 2- $(\text{not}P \text{ and } \text{not}Q) \text{ or } (Q \text{ or } P)$

Exercise2 :

Let P , Q and R be three propositions.

Verify if the logical equivalence between

- 1- $P1 : \text{not}((P \text{ and } Q) \Rightarrow \text{not } P)$ and $P2 : (P \text{ and } Q) \text{ and } P$
- 2- $Q1 : (P \text{ or } (Q \text{ and } R))$ and $Q2 : (P \text{ or } Q) \text{ and } (P \text{ or } R)$

Hold.

Exercise3 :

Give the negation of :

- 1- f is a decreasing function
- 2- the value of a real x is greater than the real y
- 3- the equation has a unique solution
- 4- the proposition P is true or false
- 5- the function g defined in $\mathbb{R}$ is not continued at zero

Exercise4 :

The following implications are true or false ? (without justification)

- 1- x is a nonzero real number $\Rightarrow x$ is in $\mathbb{R}$
- 2- x is in $\mathbb{R} \Rightarrow x$ is a nonzero real number