

# CENG 424

## Logic for Computer Science

Fall 2023 - Homework 2

### Propositional Logic

---

Due date: 5 November 2023, Sunday, 23:59 (No Late Allowed!)

## 1 Specifications

1. Your work must be on PDF file preferably outputted by a  $\text{\LaTeX}$  file.
2. Your work must be of your own. This is an individual homework, no collaboration is allowed.
3. Your work must obey, of course, **zero tolerance policy for cheating**.
4. Your work must be submitted before the deadline. There is **no late submission policy**.
5. Your work must be submitted as specified in the section 3, otherwise there is a penalty of 10 points.
6. You may ask your questions by sending an email to “adhd@ceng.metu.edu.tr”.

## 2 Questions

1. Suppose that you are given the following premises:

- $p \wedge q \Rightarrow r$
- $q \vee \neg q$
- $p$

Show that the sentence  $r$  is logically entailed by the supplied premises.

2. Give a proof of  $((p \Rightarrow \neg r) \Rightarrow \neg p)$  from the premises below using Modus Ponens and the standard axiom schemata.

$$p \Rightarrow q, \quad q \Rightarrow r$$

3. Give a proof of the sentence  $p$  from the single premise  $\neg\neg p$  using only Modus Ponens and the standard axiom schemata.
4. Use propositional resolution to prove the following sentence is valid:

$$(p \vee q \Rightarrow r) \Rightarrow (p \Rightarrow (q \Rightarrow r))$$

5. Use DPLL algorithm to show that the set of clauses:

$$\neg p \vee q \vee s \quad p \vee s \vee t \quad p \vee s \vee \neg t \quad p \vee s \vee t \quad p \vee \neg s \vee \neg t \quad p \vee \neg s \vee t \quad p \vee q \vee \neg s \quad p \vee \neg q \vee s$$

is satisfiable or not

### 3 Submission

Please submit a PDF file named `hw2_e1234567.pdf` to `gradescope.com`, where 1234567 refers to your student identification number.