Lassonde School of Engineering

Dept. of EECS

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MATH1090 A. Problem Set No2

Posted: Oct. 4, 2023

Due: Oct. 27, 2023; by 2:00pm, in eClass.

Q: **How do I submit?**

A:

(1) **Submission must be a SINGLE *standalone* file to eClass. Submission by email is not accepted.**

(2) **Accepted File Types: PNG, JPEG, PDF, RTF, MS WORD, OPEN OFFICE, ZIP**

(3) **Deadline is strict, electronically limited.**

(4) **MAXIMUM file size = 10MB**

It is not allowed to use truth tables (or any of their shortcuts) in ANY of the problems below. Such methods get zero marks.

1. By definition, in a Σ-proof we are free to write an axiom A ($A \in \Lambda$) or a "hyp" A from Σ ($A \in \Sigma$) as many times as we like. Each time the justification is "axiom" or "wff from Σ" according to the case.

(a) (2 MARKS) Can we also write, say, *consecutively 10 times* in a row the *result* B of Eqn applied on *previous* wff X and Y in the proof? What reason will we give each of the 10 times?

(b) (1 MARKS) What if the 10 times are not consecutive? Can we do it? What reason will we give?

2. (4 MARKS) Prove **Equationally** that $A, B \vdash A \equiv B$.

3. (4 MARKS) Prove **Equationally** that for any A,

$$\bot \vdash A$$

4. (4 MARKS) Prove **Equationally** that $\vdash A \wedge B \equiv B \wedge A$.

Hint. Insert the missing brackets first (but not the outermost).

5. (4 MARKS) Prove **Equationally** that $\vdash A \wedge (A \vee B) \equiv A$.

6. (3 MARKS) Prove **Equationally** that $\vdash B \wedge (A \vee \neg A) \equiv B$.

7. (3 MARKS) Prove **Equationally** that $\vdash A \vee B \vee \neg A$.