MATH 437: HOMEWORK 6 — NINA CHALGHARI

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① The Parallel Axiom is independent of the other four axioms. This is because the proof of the Parallel Axiom requires a different branch of non-Euclidean geometry. This proof needs a strategy to meta-prove that a statement does not follow from the axioms. Because this proofs requires a different set of axioms, it needs to be proved with Hyperbolic Geometry's axioms.

② Kurt Gödel published his theorems of incompleteness which states that it is impossible to have a consistent set of axioms which can prove or any theorem / axiom of natural numbers. This means that although we can find something to be true, the proof may not be possible because it goes beyond the scope of established axioms.

③ According to Dr. Z's 125th Opinion, there is a flaw with Gödel's and Turing's undecidability of Halting Problem's theorems. The flaw is infinity. Turing's "Infinite Tape" says N can be any positive integer where the program halts; however, Dr. Z proposes that it stops at M where M is a finite set. Gödel proposes that there are true and unprovable statements. Dr. Z believes that every meaningful statement is provable if true and disprovable if false.

④ (i) { · A is a liar, · B is a truth-teller } { · A is truth-teller, · B is liar }

(ii) { · A is a liar, · B is a truth-teller }

(iii) [A, B, C]:
[T, T, T] ⇒ not true
[T, T, F] ⇒ not true
[T, F, F] ⇒ not true
[F, F, F] ⇒ not true
[F, F, T] ⇒ not true
[F, T, T] ⇒ not true
[F, T, F] ⇒ not true
[T, F, T] ⇒ not true
F
* this is not possible *

(iv) [A, B, C, D]:
[T, T, T, T] ⇒ not possible
[T, T, T, F] ⇒ not true
[T, T, F, F] ⇒ not true
[T, F, F, F] ⇒ not true
[F, F, F, F] ⇒ not true
* [T, F, T, F] ⇒ CONSISTANT
[T, F, F, T] ⇒ not true
[F, T, T, F] ⇒ not true
* [F, T, F, T] ⇒ CONSISTANT
[F, T, T, T] ⇒ not true
[F, F, T, T] ⇒ not true
[F, F, F, T] ⇒ not true
F