## Eliminating Undecidability and Incompleteness in Formal Systems

To eliminate incompleteness, undecidability and inconsistency from formal systems we only need to convert the formal proofs to theorem consequences of symbolic logic to conform to the sound deductive inference model.

Within the sound deductive inference model there is a *(connected sequence of valid deductions from true premises to a true conclusion)* thus unlike the formal proofs of symbolic logic provability cannot diverge from truth.

When we consider sound deductive inference to the negation of a conclusion we now also have a definitive specification of falsity.

Within the sound deductive inference model we can be certain that valid inference from true premises derives a true conclusion.

∴ Within the sound deductive inference model any argument that does not evaluate to True or False is unsound, there is no undecidability or incompleteness in this model.

The key criterion measure that the sound deductive inference model would add to the formal proofs to theorem consequences of symbolic logic would be the semantic notion of soundness. That formal proofs cannot recognize and reject unsound logic sentences is an expressiveness gap of formal proofs relative to the sound deductive inference model.

### Formalizing the Sound Deductive Inference Model in Symbolic Logic

*Axiom(0) Stipulates this definition of Axiom:*
Expressions of language defined to have the semantic value of Boolean True.
Provides the symbolic logic equivalent of true premises.

*Stipulating this specification of True and False:* (TRUE ↔ ⊤ ∧ FALSE ↔ ⊥)
Axiom(1) ∀F ∈ Formal_System ∀x ∈ Closed_WFF(F) (True(F, x) ↔ (F ⊢ x))
Axiom(2) ∀F ∈ Formal_System ∀x ∈ Closed_WFF(F) (False(F, x) ↔ (F ⊢ ¬x))
Thus stipulating that consequences are provable from axioms.

*Stipulating that formal systems are Boolean:*
Axiom(3) ∀F ∈ Formal_System ∀x ∈ Closed_WFF(F) (True(F,x) ∨ False(F,x))
Screens out semantically unsound sentences as not belonging to the formal system.

**Applying the Formalized Sound Deductive Inference Model**

*The third step of the Tarski Undefinability Theorem proof:*
(3) $x \notin Pr$ if and only if $x \in Tr$
is refuted by contradicting simplified Axiom(1): $x \in Tr \leftrightarrow x \in Pr$

*The following logic sentence is refuted on the basis of Axiom(3)*
$\exists F \in Formal\_System\ \exists x \in Closed\_WFF(F)\ (G \leftrightarrow ((F \nvdash G) \land (F \nvdash \neg G)))$
There is no sentence G of Formal System F that is neither True nor False in F.

*Making the following paragraph false:*
The first incompleteness theorem states that in any consistent formal system F within which a certain amount of arithmetic can be carried out, there are statements of the language of F which can neither be proved nor disproved in F. (Raatikainen 2018)

Raatikainen, Panu, "Gödel's Incompleteness Theorems", The Stanford Encyclopedia of Philosophy (Fall 2018 Edition), Edward N. Zalta (ed.), URL = https://plato.stanford.edu/archives/fall2018/entries/goedel-incompleteness/.