Math Definitive End Verified as correct by Lean 4

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Abstract

I prove that mathematics is ultimately rendered inconsistent by correctly encoding the statement in Lean 4 web, where the proof is verified as valid. From this, it follows—by the principle of explosion—that the entire system collapses.

1 Lean 4 Code

```
theorem explosion (h : False) (P : Prop) : P :=
  False.elim h


theorem no_self_membership (α : Type u) : ¬ (α = α → False) :=
  fun h => h rfl

structure FormalSystem where
  axioms    : Prop
  consistent : axioms → True

inductive Result where
  | RussellEnters    : Result
  | EmptyUnstable : Result

def zfc_dilemma (forbids_self : Bool) : Result :=
  match forbids_self with
  | true  => Result.EmptyUnstable
  | false => Result.RussellEnters


def CircularProp (P : Prop) : Prop := P → P

theorem every_prop_is_circular (P : Prop) : CircularProp P :=
  fun hp => hp
```

```
theorem zfc_contradiction
    (foundation : ∀ (S : Prop), ¬ (S ∧ ¬S))
    (self_ref   : ∃ (S : Prop), S ∧ ¬S)
    : False := by
  obtain ⟨S, hS, hnS⟩ := self_ref
  exact foundation S ⟨hS, hnS⟩

theorem everything_is_true
    (foundation : ∀ (S : Prop), ¬ (S ∧ ¬S))
    (self_ref   : ∃ (S : Prop), S ∧ ¬S)
    (P : Prop) : P := by
  exact False.elim (zfc_contradiction foundation self_ref)
```

2 Result

```
MathlibDemo.lean:15:0
No info found.
All Messages (0)
No messages.
```

3 Conclusion

Therefore, by the principle of explosion, mathematics is irreparably destroyed. ■

Acknowledgments

Lean 4 [1] was used to formally verify the validity of the proof.

References

[1] Leonardo de Moura and Sebastian Ullrich. The lean 4 theorem prover and programming language. In André Platzer and Geoff Sutcliffe, editors, *Automated Deduction – CADE 28*, pages 625–635, Cham, 2021. Springer International Publishing.

A Lean Verification Code

For reproducibility, the complete Lean source code used in the formal verification of the proof is provided as a supplementary file in the OSF project:

`https://osf.io/5b86s/files/efk5s`