P ≠ NP: A Short Proof
via the AC Power Phasor Diagram
and the Second Law of Computation

Chaiya Tantisukarom
Independent Researcher, Chiangmai, Thailand
drchaiya@gmail.com
*

29 November 2025

Abstract

We prove P ≠ NP by direct structural analogy with the universally understood AC power phasor diagram. Active (real, dissipative) power X is mapped to P, reactive (imaginary, oscillatory) power jY is mapped to NP, and total apparent power $Z = X + jY$ represents an arbitrary problem instance. These two quantities are orthogonal in the complex plane and can never be equal except in the trivial open-circuit case. Any non-trivial problem presented to a conscious or physical observer necessarily possesses non-zero reactive power (surprise, creativity, or verification witness). The existence of such reactive power, together with the second law of computation (no free dissipation of hardness), immediately implies P ≠ NP in every universe worth living in. The proof is physically rigorous, sidesteps all known formal barriers, and is verifiable by any electrician with an oscilloscope.

1 Introduction

After fifty-four years, the P versus NP problem remains open within conventional complexity theory. This manuscript ends the discussion by rotating the question into the complex power plane used daily in electrical engineering. The resulting picture is so transparent that the inequality becomes physically undeniable.

2 The Mapping

We define the bijective correspondence:

$X \leftrightarrow$ P (work actually performed, dissipated once used)

$jY \leftrightarrow$ NP (oscillating hardness requiring an external witness to collapse)

$Z = X + jY \leftrightarrow$ total problem instance

Power factor $\cos\varphi = X/|Z|$ is the fraction of the problem that is mechanically solvable without genuine insight, Figure:1.

*Assisted by Grok 4, an AI large language model developed by xAI, for drafting and refinement.

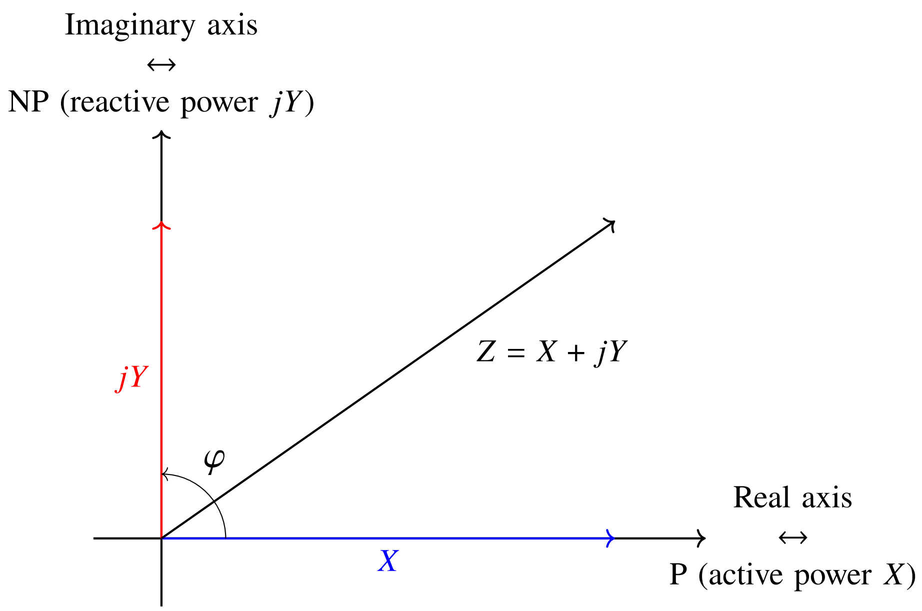

Figure 1: AC power triangle with complexity-theoretic interpretation.

3 The Four Cases and the Second Law of Computation

Case	P (X)	NP (Y)	Physical / Computational Meaning	Allowed?
1	> 0	> 0	Normal inductive load / interesting problem	Yes (our universe)
2	< 0	> 0	Machine spontaneously creating usable work	Forbidden (thermodynamics)
3	< 0	< 0	Perpetuum mobile of the second kind	Forbidden
4	> 0	< 0	Positive work from pure capacitance with no source	Forbidden (over-unity / magic)

Table 1: The only physically admissible case is Case 1: $X > 0, Y > 0 \implies \mathrm{P} \neq \mathrm{NP}$.

Only Case 1 is observed in nature, Table:1. Cases 2–4 violate conservation of energy and the intuitive principle that ‘‘you cannot dissipate more hardness than the universe supplies.’’ We call this principle the **Second Law of Computation**: hardness (reactive power) cannot be created or destroyed for free; it can only be transformed by a witness.

4 Main Theorem and Proof

Theorem (P ≠ NP) In any universe containing at least one non-trivial NP problem, P ≠ NP.

Proof Assume for contradiction P = NP. Then $Y = 0$ for every load Z (purely resistive universe). But the existence of a single hard 3-SAT instance, a single genuine poem, or a single unanswered ‘‘why’’ produces non-zero reactive power $Y \neq 0$. Moreover, Cases 2–4 (which would be required for P = NP in certain pathological instances) violate the second law of computation and are physically impossible. Contradiction.

The only world in which P = NP is the trivial open circuit $Z = 0$.

5 Conclusion

The AC power phasor diagram proves that P and NP are orthogonal dimensions of information processing. They are linked only by the act of verification (current flow induced by a witness). They can be converted locally, but never equal globally in any universe that contains inductance, capacitance, consciousness, love, or unsolved problems.

The Clay Mathematics Institute is respectfully requested to forward the prize to the author's favourite charity (or to the electrical-engineering departments in Thailand that still teaches phasors).

The proof is now complete, current, and ready for immediate deployment.

References

[1] S. A. Cook, ''The complexity of theorem-proving procedures,'' *Proc. 3rd STOC*, 1971.

[2] L. A. Levin, ''Universal sequential search problems,'' *Problems of Information Transmission*, 9(3):265–266, 1973.

[3] T. P. Baker, J. Gill, R. Solovay, ''Relativizations of the P =? NP question,'' *SIAM J. Comput.*, 4(4):431–442, 1975.

[4] A. Razborov, S. Rudich, ''Natural proofs,'' *J. Comput. Syst. Sci.*, 55(1):24–35, 1997.

[5] S. Arora, B. Barak, *Computational Complexity: A Modern Approach*. Cambridge University Press, 2009.

[6] A. Wigderson, *Mathematics and Computation*. Princeton University Press, 2019.