# Highlights of Fermat's Last Theorem

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Background:

- Pierre de Fermat was a 17th century French mathematician who discovered Fermat's Last Theorem"and managed to prove cases n=4, n=5, but did not finish the proof. [3]
- The first successful proof of Fermat's last Theorem was released in 1994 by Andrew Wiles. [1]
- Before Fermat's last theorem was proved by Sir. Wiles, many people have tried to prove it using very simple methods, and they all failed.
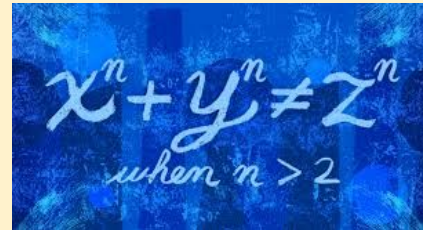

Pierre de Fermat
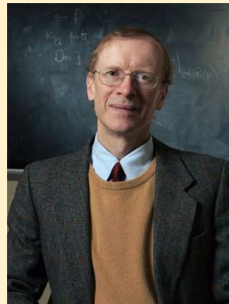
Andrew Wiles

What is the theorem:

- Fermat's Last Theorem states that there are no natural numbers $x, y,$ and z such that $X^n+y^n=z^n$, where n is a natural number equal to 2 or more.[1]

Applications:

- Fermat's last theorem can really be applied in number theory. [4]
- Gerhard Frey noticed that there was a connection between the equation $X^n+y^n=z^n$ and the theory of elliptic curves.[1]
- Fermat's Last Theorem has contributed to high-speed computing. The theorem applies when $l < 2000$ (l is the odd prime exponent in the Fermat relation). [6]

[7]

Who is Andrew Wiles:

- Sir. Wiles was a mathematician who found Fermat's theorem to be quite fascinating.
- Sir. Wiles is a Royal Society Research Professor at the University of Oxford, specializing in number theory. [1]
- Sir. Wiles was the one who provided a proof for Fermat's theorem. With the aid from Richard Taylor, Wiles finished his proof that took him over six years to finish. [5]
- Once Wiles proof was accepted, he won the Abel prize. [5]

Problems and How they were fixed:

- In 1993, Sir.Wiles presented his proof of the Taniyama-Shimura conjecture for semistable elliptic curves; together with Ribet's proof of the epsilon conjecture, but it was incorrect in the peer review, because it contained an error in a bound on the order of a particular group. It took him a year to fix the error, Sir.Wiles' proof succeeded by:
- (1) Replacing elliptic curves with Galois representations,
- (2) Reducing the problem to a class number formula,
- (3) Tying up loose ends that arise because the formalisms fail in the simplest degenerate cases (Cipra 1995). [2]

Further Research

- It would be interesting to know how Wiles combined all his theorems in his proof.
- What is the application field of Fermat's last theorem ?
- Has Mr. Wiles worked on solving any other theorems?

Resources:

- [1]https://en.wikipedia.org/wiki/Fermat%27s_Last_Theorem
- [2]https://mathworld.wolfram.com/FermatsLastTheorem.html
- [3]https://www.quantamagazine.org/why-the-proof-of-fermats-last-theorem-doesnt-need-to-be-enhanced-20190603/
- [4]https://www.whitman.edu/Documents/Academics/Mathematics/byerleco.pdf
- [5]https://www.npr.org/sections/thetwo-way/2016/03/17/470786922/professor-who-solved-fermat-s-last-theorem-wins-math-s-abel-prize
- [6]https://www.ncbi.nlm.nih.gov/pmc/articles/PMC527932/pdf/pnas00728-0036.pdf
- [7]https://www.quantamagazine.org/why-the-proof-of-fermats-last-theorem-doesnt-need-to-be-enhanced-20190603/