
Unveiling An Elementary Proof for Fermat's Last Theorem

Final Corrected Version

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Abstract

This paper presents a straightforward and elementary proof of Fermat's Last Theorem (FLT), asserting that there are no integer solutions to $a^n + b^n = c^n$ for $n > 2$. Leveraging basic number theory and algebraic manipulations, we offer a concise demonstration aiming to make this fundamental result accessible to a broad mathematical audience.

Keywords: Transformation equations to Fermat's equations.

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1 Introduction

Fermat's Last Theorem, famously stated by Pierre de Fermat in 1637, has intrigued mathematicians for centuries. The theorem states that there are no integer solutions exist for $a^n + b^n = c^n$, where n is an integer greater than 2.

Since Fermat, Euler and Gauss had already proved the theorem for the cases $a^4 + b^4 = c^4$ and $a^3 + b^3 = c^3$, it would suffice to prove the theorem for the exponent $n = p$, where p is any prime > 3 [1]

Hundreds of mathematicians in the last 350 years contributed to Fermat's Last Theorem by which number theory developed leaps and bounds. Sophie Germain, E.E.Kummer, Galois, Shimura-Taniyama-Weils, Frey, Ken Ribet, Serre, Richard Taylor, Faltings and many eminent mathematicians for centuries contributed to this theorem. Finally Andrew Wiles provided a complete proof in 1994 using advanced techniques [2], [3], [4].

This paper revisits the problem through elementary methods, aiming for simplicity and clarity.

2 Assumptions

- 1) We hypothesize that all r , s and t are non-zero integers satisfying the equation $r^p + s^p = t^p$ where p is any prime > 3 and establish a contradiction in this proof. Clearly $\gcd(r, s, t) = 1$ and any two of the variables r , s and t cannot simultaneously be squares. Without loss of generality we can have r as a non-square integer, and r , s and t are coprimes to z^3 where $x^3 + y^3 = z^3$ where y is a square integer and x is not a square integer.
- 2) We use another auxiliary equation $x^3 + y^3 = z^3$ (proven case) in which we assert both x and y as positive integers; z^3 will be a positive integer and z and z^2 will be irrational. We define in this proof x as a non-square integer and y as a square integer. Hence \sqrt{xy} will be irrational.
- 3) We combine the two equations $x^3 + y^3 = z^3$ and $r^p + s^p = t^p$ by means of transformation equations, using parameters called a , b , c , d , e and f .
- 4) We use the Ramanujan-Nagell equation's three solutions $2^5 = 7 + 5^2$; $2^7 = 7 + 11^2$; and $2^{15} = 7 + 181^2$, in the genreal solution $2^n = 7 + \ell^2$, excluding the two solutions $2^3 = 7 + 1^2$ and $2^4 = 7 + 3^2$. Therefore n is odd and ℓ will be an odd prime, either 5 or 11 or 181, for this proof.
- 5) r is coprime to x .
- 6) By giving suitable values for x and y we can fix z^3 as coprime to r , s and t .

Proof. By trails, we have created the following transformation equations

$$\left(\frac{a\sqrt{\ell^{7/3}r} + b\sqrt{t^p}}{\sqrt{z^3}} \right)^2 + \left(\frac{c\sqrt{r^p} + d\sqrt{r}}{\sqrt{x}} \right)^2 = \left(e\sqrt{7^{1/3}} + f\sqrt{\ell^{5/3}} \right)^2$$

and

$$\left(a\sqrt{s^p} - b\sqrt{2^{n/2}} \right)^2 + \left(c\sqrt{s} - d\sqrt{2^{3n/2}} \right)^2 = \left(e\sqrt{t} - f\sqrt{7^{5/3}y} \right)^2 \quad (1)$$

representing the equations $x^3 + y^3 = z^3$ and $r^p + s^p = t^p$ respectively, through the parameters called a , b , c , d , e and f .

Here we have used only three solutions of Ramanujan-Nagell equations $2^n = 7 + \ell^2$, namely $2^5 = 7 + 5^2$, $2^7 = 7 + 11^2$ and $2^{15} = 7 + 181^2$, where n is odd and ℓ is an odd prime, either 5 or 11 or 181.

From equation (1) we get

$$a\sqrt{\ell^{7/3}r} + b\sqrt{t^p} = \sqrt{x^3z^3} \quad (2)$$

$$a\sqrt{s^p} - b\sqrt{2^{n/2}} = \sqrt{r^p} \quad (3)$$

$$c\sqrt{r^p} + d\sqrt{r} = \sqrt{xy^3} \quad (4)$$

$$c\sqrt{s} - d\sqrt{2^{3n/2}} = \sqrt{s^p} \quad (5)$$

$$e\sqrt{7^{1/3}} + f\sqrt{\ell^{5/3}} = \sqrt{z^3} \quad (6)$$

$$\text{and } e\sqrt{t} - f\sqrt{7^{5/3}y} = \sqrt{t^p} \quad (7)$$

Solving simultaneously (2) and (3), (4) and (5), (6) and (7), we get the values of the parameters as given by

$$a = \left(\sqrt{2^{n/2}x^3z^3} + \sqrt{r^p t^p} \right) / \left(\sqrt{2^{n/2}\ell^{7/3}r} + \sqrt{s^p t^p} \right)$$

$$b = \left(\sqrt{x^3z^3s^p} - \sqrt{\ell^{7/3}r^{p+1}} \right) / \left(\sqrt{2^{n/2}\ell^{7/3}r} + \sqrt{s^p t^p} \right)$$

$$c = \left(\sqrt{2^{3n/2}xy^3} + \sqrt{r s^p} \right) / \left(\sqrt{2^{3n/2}r^p} + \sqrt{r s} \right)$$

$$d = \left(\sqrt{xy^3s} - \sqrt{r^p s^p} \right) / \left(\sqrt{2^{3n/2}r^p} + \sqrt{r s} \right)$$

$$e = \left(\sqrt{7^{5/3}yz^3} + \sqrt{t^p \ell^{5/3}} \right) / \left(7\sqrt{y} + \sqrt{\ell^{5/3}t} \right)$$

$$\text{and } f = \left(\sqrt{z^3t} - \sqrt{7^{1/3}t^p} \right) / \left(7\sqrt{y} + \sqrt{\ell^{5/3}t} \right)$$

From (2) and (7) we get

$$\begin{aligned} \sqrt{t^p} \times \sqrt{t^p} &= \left(\sqrt{x^3z^3} - a\sqrt{\ell^{7/3}r} \right) \left(e\sqrt{t} - f\sqrt{7^{5/3}y} \right) / (b) \\ \text{i.e., } t^p &= \frac{\left\{ (e)\sqrt{x^3z^3t} - (f)\sqrt{7^{5/3}x^3yz^3} - (ae)\sqrt{\ell^{7/3}rt} + (af)\sqrt{7^{5/3}\ell^{7/3}yr} \right\}}{(b)} \end{aligned}$$

From (3) and (4) we have

$$\sqrt{r^p} \times \sqrt{r^p} = \left(a\sqrt{s^p} - b\sqrt{2^{n/2}} \right) \left(\sqrt{xy^3} - d\sqrt{r} \right) / (c)$$

$$\text{i.e. } r^p = \frac{\left\{ (a)\sqrt{xy^3s^p} - (ad)\sqrt{rs^p} - (b)\sqrt{2^{n/2}xy^3} + (bd)\sqrt{2^{n/2}r} \right\}}{(c)}$$

From (3) and (5) we get

$$\begin{aligned} \sqrt{s^p} \cdot \sqrt{s^p} &= \frac{\left(\sqrt{r^p} + b\sqrt{2^{n/2}} \right) \left(c\sqrt{s} - d\sqrt{2^{3n/2}} \right)}{(a)} \\ \text{i.e., } s^p &= \frac{\left\{ c\sqrt{r^ps} - (d)\sqrt{2^{3n/2}r^p} + (bc)\sqrt{2^{n/2}s} - (bd)(2^n) \right\}}{(a)} \end{aligned}$$

Substituting the above equivalent values of t^p , r^p and s^p in the equation $t^p = r^p + s^p$, and on multiplying both sides by $\{(abc)\}$, we get the equation (8)

$$\begin{aligned} \{ac\} \left\{ (e)\sqrt{x^3z^3t} - (f)\sqrt{7^{5/3}x^3yz^3} - (ae)\sqrt{\ell^{7/3}rt} + (af)\sqrt{7^{5/3}\ell^{7/3}yr} \right\} \\ = \{ab\} \left\{ (a)\sqrt{xy^3s^p} - (ad)\sqrt{rs^p} - (b)\sqrt{2^{n/2}xy^3} + (bd)\sqrt{2^{n/2}r} \right\} \\ + \{bc\} \left\{ (c)\sqrt{r^ps} - (d)\sqrt{2^{3n/2}r^p} + (bc)\sqrt{2^{n/2}s} - (bd)(2^n) \right\} \end{aligned} \quad (8)$$

We are interested in computing all rational terms in equation (8), after multiplying both sides by

$$\left(\sqrt{2^{n/2}\ell^{7/3}r} + \sqrt{s^pt^p} \right)^3 \left(\sqrt{2^{3n/2}r^p} + \sqrt{rs} \right)^2 \left(7\sqrt{y} + \sqrt{\ell^{5/3}t} \right)$$

to be free from denominators on the parameters a , b , c , d and f and again multiplying both sides by $\sqrt{yz^3}$ for getting some rational terms, as worked out below, term by term.

I term in LHS of Equation (8), after multiplying by the relevant terms, and substituting for $\{ace\}$

$$\begin{aligned} &= \sqrt{x^3z^3t} \left\{ \left(\ell^{7/3}r\sqrt{2^n} \right) + (s^pt^p) + \left(2\sqrt{2^{n/2}\ell^{7/3}rs^pt^p} \right) \right\} \left(\sqrt{2^{3n/2}r^p} + \sqrt{rs} \right) \\ &\times \sqrt{yz^3} \left(\sqrt{2^{n/2}x^3z^3} + \sqrt{r^pt^p} \right) \left(\sqrt{2^{3n/2}xy^3} + \sqrt{rs^p} \right) \left(\sqrt{7^{5/3}yz^3} + \sqrt{t^p\ell^{5/3}} \right) \end{aligned}$$

(i) On multiplying by

$$\left\{ \sqrt{x^3z^3t} \left(2\sqrt{2^{n/2}\ell^{7/3}rs^pt^p} \right) \right\} \sqrt{2^{3n/2}r^p} \sqrt{yz^3} \sqrt{r^pt^p} \sqrt{rs^p} \sqrt{t^p\ell^{5/3}}$$

we get

$$\left\{ (2^{n+1} \ell^2 z^3 r^{p+1} s^p t^p) \sqrt{t^{p+1}} \sqrt{x^3 y} \right\}$$

which is irrational, since y is a square and x is non-square.

(ii) Also on multiplying by

$$\left\{ \sqrt{x^3 z^3 t} \left(2\sqrt{2^{n/2} \ell^{7/3} r s^p t^p} \right) \sqrt{rs} \sqrt{yz^3} \sqrt{r^p t^p} \sqrt{2^{3n/2} x y^3} \sqrt{t^p \ell^{5/3}} \right\}$$

we get

$$\left\{ (2^{n+1} \ell^2 x^2 y^2 z^3 r t^p) \sqrt{(rst)^{p+1}} \sqrt{r} \right\}$$

which is irrational, since r is not a square.

II term in LHS of Equation (B), after multiplying by the respective terms, and substituting for $\{acf\}$

$$\begin{aligned} &= \left(-\sqrt{7^{5/3} x^3 y z^3} \right) \left\{ \left(\ell^{7/3} r \sqrt{2^n} \right) + (s^p t^p) + \left(2\sqrt{2^{n/2} \ell^{7/3} r s^p t^p} \right) \right\} \left(\sqrt{2^{3n/2} r^p} + \sqrt{rs} \right) \\ &\quad \times \sqrt{yz^3} \left(\sqrt{2^{n/2} x^3 z^3} + \sqrt{r^p t^p} \right) \left(\sqrt{2^{3n/2} x y^3} + \sqrt{r s^p} \right) \left(\sqrt{z^3 t} - \sqrt{7^{1/3} t^p} \right) \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{7^{5/3} x^3 y z^3} \right) (s^p t^p) \sqrt{rs} \sqrt{yz^3} \sqrt{r^p t^p} \sqrt{r s^p} \left(-\sqrt{7^{1/3} t^p} \right) \right\}$$

we get

$$\left\{ (7 y z^3 s^p t^{2p}) \sqrt{(rs)^{p+1}} \sqrt{x^3 r} \right\}$$

which will be irrational, since r is coprime to x .

III term in LHS of Equation (B), after multiplying by the respective terms, and substituting for $\{a^2 ce\}$

$$\begin{aligned} &= \left(-\sqrt{\ell^{7/3} r t} \right) \left(\sqrt{2^{n/2} \ell^{7/3} r} + \sqrt{s^p t^p} \right) \left(\sqrt{2^{3n/2} r^p} + \sqrt{rs} \right) \sqrt{yz^3} \\ &\quad \times \left\{ \left(x^3 z^3 \sqrt{2^n} \right) + (r^p t^p) + \left(2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right) \right\} \\ &\quad \times \left(\sqrt{2^{3n/2} x y^3} + \sqrt{r s^p} \right) \left(\sqrt{7^{5/3} y z^3} + \sqrt{t^p \ell^{5/3}} \right) \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{\ell^{7/3} r t} \right) \sqrt{s^p t^p} \sqrt{rs} \sqrt{yz^3} \left(2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right) \sqrt{2^{3n/2} x y^3} \sqrt{t^p \ell^{5/3}} \right\}$$

we get

$$\left\{ - (2^{n+1} \ell^2 x^2 y^2 z^3 t^p) \sqrt{r} \sqrt{(rst)^{p+1}} \right\}$$

Which is irrational, since r is not square.

IV term in LHS of Equation (8), after multiplying by the respective terms, and substituting for $\{a^2 cf\}$

$$\begin{aligned} &= \sqrt{7^{5/3} \ell^{7/3} yr} \left(\sqrt{2^{n/2} \ell^{7/3} r} + \sqrt{s^p t^p} \right) \left(\sqrt{2^{3n/2}} + \sqrt{rs} \right) \sqrt{yz^3} \\ &\quad \times \left\{ \left(x^3 z^3 \sqrt{2^n} \right) + (r^p t^p) + 2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right\} \\ &\quad \times \left(\sqrt{2^{3n/2} x y^3} + \sqrt{r s^p} \right) \left(\sqrt{z^3 t} - \sqrt{7^{1/3} t^p} \right) \end{aligned}$$

There is no rational part in this term, (Since ℓ is a prime, either 5 or 11 or 181).

I term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{a^2 b\}$

$$\begin{aligned} &= \sqrt{xy^3 s^p} \left\{ (r^p \sqrt{2^{3n}}) + (rs) + \left(2\sqrt{r^{p+1} \sqrt{2^{3n/2} s}} \right) \right\} \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \sqrt{yz^3} \\ &\quad \times \left\{ (x^3 z^3) \sqrt{2^n} + (r^p t^p) + \left(2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right) \right\} \left(\sqrt{x^3 z^3 s^p} - \sqrt{\ell^{7/3} r^{p+1}} \right) \end{aligned}$$

(i) On multiplying by

$$\left\{ \sqrt{xy^3 s^p} \left[\left\{ (r^p \sqrt{2^{3n}}) (x^3 z^3) \sqrt{2^n} \right\} + (rs)(r^p t^p) \right] (7\sqrt{y}) \sqrt{yz^3} \sqrt{x^3 z^3 s^p} \right\}$$

We get

$$\left\{ (7x^2 y^2 z^3 s^p) \sqrt{y} (2^{2n} x^3 z^3 r^p + r^{p+1} s t^p) \right\}$$

which is rational, since y is a square.

(ii) Again on multiplying by

$$\left\{ \sqrt{xy^3 s^p} \left(2\sqrt{r^{p+1} \sqrt{2^{3n/2} s}} \right) \sqrt{\ell^{5/3} t} \right\} \sqrt{yz^3} \left(2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right) \left(-\sqrt{\ell^{7/3} r^{p+1}} \right)$$

We get

$$\left\{ - (2^{n+2} x^2 y^2 z^3 \ell^2 r^p) \sqrt{r} \sqrt{(rst)^{p+1}} \right\}$$

which is irrational, since r is not square.

II term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{a^2 b\}d$

$$= \left(-\sqrt{r s^p} \right) \left(\sqrt{2^{3n/2} r^p} + \sqrt{rs} \right) \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \sqrt{yz^3}$$

$$\begin{aligned} & \times \left\{ \left(x^3 z^3 \sqrt{2^n} \right) + (r^p t^p) + 2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right\} \\ & \times \left(\sqrt{x^3 z^3 s^p} - \sqrt{\ell^{7/3} r^{p+1}} \right) \left(\sqrt{xy^3 s} - \sqrt{r^p s^p} \right) \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{rs^p} \right) \sqrt{2^{3n/2} r^p} \sqrt{\ell^{5/3} t} \sqrt{yz^3} \left(2\sqrt{2^{n/2} x^3 z^3 r^p t^p} \right) \left(-\sqrt{\ell^{7/3} r^{p+1}} \right) \sqrt{xy^3 s} \right\}$$

We get

$$\left\{ - (2^{n+1} x^2 y^2 z^3 \ell^2 r^p) \sqrt{(rst)^{p+1}} \sqrt{r} \right\}$$

which will be irrational, since r is non-square integers.

III term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{ab^2\}$

$$\begin{aligned} & = \left(-\sqrt{2^{n/2} xy^3} \right) \left\{ (r^p \sqrt{2^{3n}}) + (rs) + \left(2\sqrt{r^{p+1}} \sqrt{2^{3n/2} s} \right) \right\} \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \\ & \times \sqrt{yz^3} \left(\sqrt{2^{n/2} x^3 z^3} + \sqrt{r^p t^p} \right) \left\{ (x^3 z^3 s^p) + (\ell^{7/3} r^{p+1}) - \left(2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \right\} \end{aligned}$$

(i) On multiplying by

$$\left\{ \left(-\sqrt{2^{n/2} xy^3} \right) \left(2\sqrt{r^{p+1}} \sqrt{2^{3n/2} s} \right) \sqrt{\ell^{5/3} t} \sqrt{yz^3} \sqrt{r^p t^p} \left(-2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \right\}$$

We get

$$\left\{ (2^{n+2} x^2 y^2 z^3 \ell^2) (r^p \sqrt{(rst)^{p+1}} \sqrt{r}) \right\}$$

which is irrational, since r is not a square.

(ii) Also on multiplying by

$$\left\{ \left(-\sqrt{2^{n/2} xy^3} \right) (r^p \sqrt{2^{3n}}) (7\sqrt{y}) \sqrt{yz^3} \sqrt{2^{n/2} x^3 z^3} (x^3 z^3 s^p) \right\}$$

We get

$$\left\{ - (7 \times 2^{2n} x^5 y^2 z^6 r^p s^p) \sqrt{y} \right\}$$

which is irrational, since y is a square.

IV term in RHS of Equation (8), after multiplying by the respective terms and substituting for $\{(ab^2)d\}$

$$= \sqrt{2^{n/2} r} \left(\sqrt{2^{3n/2} r^p} + \sqrt{rs} \right) \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \sqrt{yz^3} \left(\sqrt{2^{n/2} x^3 z^3} + \sqrt{r^p t^p} \right)$$

$$\times \left\{ (x^3 z^3 s^p) + (\ell^{7/3} \sqrt{r^{p+1}}) - (2\sqrt{r^{p+1}}) \sqrt{x^3 z^3 s^p \ell^{7/3}} \right\} \left(\sqrt{xy^3 s} - \sqrt{r^p s^p} \right)$$

On multiplying by

$$\left\{ \sqrt{2^{n/2} r} \sqrt{2^{3n/2} r^p} \sqrt{\ell^{5/3} t} \sqrt{yz^3} \sqrt{r^{pt}} \left(-2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \sqrt{xy^3 s} \right\}$$

We get

$$\left\{ - (2^{n+1} x^2 y^2 z^3 \ell^2) (r^p \sqrt{(rst)^{p+1}} \sqrt{r}) \right\}$$

which is irrational, since r is a non-square integer.

V term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{bc^2\}$

$$\begin{aligned} &= \sqrt{r^p s} \left\{ \left(\ell^{7/3} r \sqrt{2^n} \right) + (s^{pt}) + 2\sqrt{2^{n/2} \ell^{7/3} r s^{pt}} \right\} \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \\ &\times \sqrt{yz^3} \left(\sqrt{x^3 z^3 s^p} - \sqrt{\ell^{7/3} r^{p+1}} \right) \left\{ \left(xy^3 \sqrt{2^{3n}} \right) + (rs^p) + 2\sqrt{2^{2n/2} xy^3 r s^p} \right\} \end{aligned}$$

(i) On multiplying by

$$\left\{ \sqrt{r^p s} (s^{pt}) (7\sqrt{y}) \sqrt{yz^3} \sqrt{x^3 z^3 s^p} (rs^p) \right\}$$

we get

$$\left\{ (7yz^3 r s^{2pt}) \sqrt{s^{p+1}} \sqrt{x^3 r^p} \right\}$$

which is irrational, since we have defined r as coprime to x .

(ii) Also on multiplying by

$$\left\{ \sqrt{r^p s} \left(2\sqrt{2^{n/2} \ell^{7/3} r s^{pt}} \right) \sqrt{\ell^{5/3} t} \sqrt{yz^3} \sqrt{x^3 z^3 s^p} \left(2\sqrt{2^{2n/2} xy^3 r s^p} \right) \right\}$$

we get

$$\left\{ (2^{n+2} \ell^2 x^2 y^2 z^3 r s^p) \sqrt{r} \sqrt{(rst)^{p+1}} \right\}$$

which is irrational, since r is not a square.

VI term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{b(cd)\}$

$$\begin{aligned} &= \left(-\sqrt{2^{3n/2} r^p} \right) \left\{ \left(\ell^{7/3} r \sqrt{2^n} \right) + (s^{pt}) + 2\sqrt{2^{n/2} \ell^{7/3} r s^{pt}} \right\} \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \\ &\times \sqrt{yz^3} \left(\sqrt{x^3 z^3 s^p} - \sqrt{\ell^{7/3} r^{p+1}} \right) \left(\sqrt{2^{3n/2} xy^3} + \sqrt{rs^p} \right) \left(\sqrt{xy^3 s} - \sqrt{r^p s^p} \right) \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{2^{3n/2} r^p} \right) \left(2\sqrt{2^{n/2} \ell^{7/3} r s^p t^p} \right) \sqrt{\ell^{5/3} t} \sqrt{y z^3} \sqrt{x^3 z^3 s^p} \sqrt{r s^p} \sqrt{x y^3 s} \right\}$$

we get

$$\left\{ - (2^{n+1} \ell^2 x^2 y^2 z^3 s^p) \sqrt{(rst)^{p+1}} \sqrt{r} \right\}$$

which will be irrational, since r is non-square integer.

VII term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{b^2 c^2\}$

$$\begin{aligned} &= \sqrt{2^{n/2} s} \left(\sqrt{2^{n/2} \ell^{7/3} r} + \sqrt{s^p t^p} \right) \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \sqrt{y z^3} \\ &\quad \times \left\{ (x^3 z^3 s^p) + (\ell^{7/3} r^{p+1}) - 2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right\} \\ &\quad \times \left\{ (x y^3 \sqrt{2^{3n}}) + (r s^p) + 2\sqrt{2^{3n/2} x y^3 r s^p} \right\} \end{aligned}$$

On multiplying by

$$\left\{ \sqrt{2^{n/2} s} \sqrt{s^p t^p} \sqrt{\ell^{5/3} t} \sqrt{y z^3} \left(-2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \left(2\sqrt{2^{3n/2} x y^3 r s^p} \right) \right\}$$

we get

$$\left\{ - (2^{n+2} x^2 y^2 z^3 \ell^2 s^p) \sqrt{(rst)^{p+1}} \sqrt{r} \right\}$$

which is irrational, since r is non-square integer.

VIII term in RHS of Equation (8), after multiplying by the respective terms, and substituting for $\{b^2(cd)\}$

$$\begin{aligned} &= (-2^n) \left(\sqrt{2^{n/2} \ell^{7/3} r} + \sqrt{s^p t^p} \right) \left(7\sqrt{y} + \sqrt{\ell^{5/3} t} \right) \sqrt{y z^3} \\ &\quad \left\{ (x^3 z^3 s^p) + (\ell^{7/3} r^{p+1}) - \left(2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \right\} \\ &\quad \left(\sqrt{2^{3n/2} x y^3} + \sqrt{r s^p} \right) \left(\sqrt{x y^3 s} - \sqrt{r^p s^p} \right) \end{aligned}$$

(i) On multiplying by

$$\left\{ (-2^n) \sqrt{s^p t^p} \sqrt{\ell^{5/3} t} \sqrt{y z^3} \left(-2\sqrt{r^{p+1}} \sqrt{x^3 z^3 s^p \ell^{7/3}} \right) \sqrt{r s^p} \sqrt{x y^3 s} \right\}$$

we get

$$\left\{ (2^{n+1} \ell^2 x^2 y z^3 s^p) \sqrt{(rst)^{p+1}} \sqrt{r} \right\}$$

which is irrational, since r is a non-square integer.

(ii) Also on multiplying by

$$\left\{ (-2^n) \sqrt{2^{n/2} \ell^{7/3} r} \sqrt{\ell^{5/3} t} \sqrt{yz^3} (x^3 z^3 s^p) \sqrt{2^{3n/2} xy^3} \sqrt{xy^3 s} \right\}$$

we get

$$\left\{ - (2^{2n} \times \ell^2 x^4 y^3 z^3 s^p) \sqrt{yz^3 rst} \right\}$$

which is irrational, while r , s and t are coprime to z .

There is no rational term in LHS of equation (8).

Sum of all rational term on RHS of equation (8)

$$(7x^2 y^2 z^3 s^p) \sqrt{y} (r^{p+1} st^p) \quad \text{(combining I \& III terms)}$$

Equating the rational terms on both sides of equation (8), and after dividing both sides by

$$(7x^2 y^2 z^3) \sqrt{y}$$

we get

$$\{ r^{p+1} s^{p+1} t^p \} = 0$$

That is either $r = 0$ or $s = 0$ or $t = 0$.

This contradicts our hypothesis that all r , s and t are non-zero integers and proves that only a trivial solution exists in the Fermat's equation $r^p + s^p = t^p$, where p is any prime > 3 .

Conclusion

Since equation (8) was derived from the transformation equations $x^3 + y^3 = z^3$ and $r^p + s^p = t^p$, the result we get from the equation (8) should reflect on the equation $r^p + s^p = t^p$.

References

- [1] Hardy G. H. and Wright E. M., An introduction to the theory of numbers, VI Edition. Oxford University Press, 2008, pp. 261–586.
- [2] Lawrence C. Washington, Elliptic Curves, Number Theory and Cryptography. Second Edition, Boca Raton, London, New York: Lawrence Chapman & Hall/CRC, Taylor & Francis Group, 2003, pp. 445–448.

- [3] Andrew Wiles, Modular Elliptic Curves and Fermat's Last Theorem, *Annals of Mathematics*, 1995; 141(3); 443–551.
- [4] [4] 13 Lectures on Fermat's Last Theorem by Paulo Ribenboim, Publisher: Springer , New York , originally published in 1979, pages 159. <https://doi.org/10.1007/978-1-4684-9342-9>.

There is no conflict of interest in this proof.