Abstract: In this document, we deal with the Erdos conjecture.

Keywords: Erdos ; Conjecture.

1. The Proof

The erdos conjecture states that
\[ \forall n \in \mathbb{N}, \exists x, y, z \in \mathbb{N} \quad \frac{4}{n} = \frac{1}{x} + \frac{1}{y} + \frac{1}{z} \]

There will be no calculus, only formulas
\[ \forall n \in \mathbb{N}, \exists k \mid n = 6k \text{ or } n=6k+1 \text{ or } n=6k+2 \text{ or } n=6k+3 \text{ or } n=6k+4 \text{ or } n=6k+5 \]

And
\[ \frac{4}{6k} = \frac{1}{3k} + \frac{1}{3k+1} + \frac{1}{3k(3k+1)} \]
\[ \frac{4}{6k+2} = \frac{1}{6k+2} + \frac{1}{2k+1} + \frac{1}{(2k+1)(6k+2)} \]
\[ \frac{4}{6k+3} = \frac{1}{6k+3} + \frac{1}{2k+2} + \frac{1}{(2k+2)(2k+1)} \]
\[ \frac{4}{6k+4} = \frac{1}{3k+2} + \frac{1}{3k+3} + \frac{1}{(3k+3)(3k+2)} \]
\[ \frac{4}{6k+5} = \frac{1}{6k+5} + \frac{1}{2(k+1)} + \frac{1}{2(k+1)(6k+5)} \]

And
\[ \frac{1}{k+c} + \frac{1}{(k+c)b(6k+1)} = \frac{(k+c)b(6k+1)}{(4b-1)(k+c)-(6k+1)b} = \frac{1}{k+c} \left( \frac{1}{b(6k+1)} + \frac{1}{(4b-1)(k+c)-(6k+1)b} \right) \]
\[ \Rightarrow \frac{4}{6k+1} = \frac{1}{b(6k+1)} + \frac{1}{k+c} + \frac{(k+c)b(6k+1)}{(4b-1)(k+c)-(6k+1)b} \]

We choose for each k, b,c for which
\[ \frac{(k+c)b(6k+1)}{(4b-1)(k+c)-(6k+1)b} \quad \text{is a positive integer and then} \]

Erdos-Straus conjecture is proved! It is always possible:

2. Conclusion

By series of formulas, we have proved the Erdos conjecture.

References

[1] Yamamoto, Koichi (1965), On the Diophantine equation \( \frac{4}{n} = \frac{1}{x} + \frac{1}{y} + \frac{1}{z} \), Memoirs of the Faculty of Science.