

A Method to Calculate Exact Values of n th Power of the Irrational Number Phi

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This project created an effective mathematical method that simplifies the power elevating process for the golden ratio, (Φ) . When using irrational numbers, approximations are used in utilizing a finite quantity of these digits. High exponentiation make results less exact, adding a long and tedious process. Assuming (ϕ) is a solution to $[x^2-x-1=0]$, then, in combination with the replacement property and multiplicative equality, you will find a relationship to the values of the powers of the number (Φ) . It started with the equation $[(\Phi)^2-(\Phi)-1=0]$, cleared $[(\Phi)^2]$ and the result was, $[(\Phi)^2=(\Phi) +1]$, then (Φ) is multiplied by the complete equation $[(\Phi)*((\Phi)^2=(\Phi)+1)]$, resulting in, $[(\Phi)^3=(\Phi)^2+(\Phi)]$, $[(\Phi)^2]$ was replaced by $[(\Phi)+1]$, $[(\Phi)^3=(\Phi)+1+(\Phi)]$, sum the similar terms and resulted in $[(\Phi)^3=2(\Phi)+1]$. The procedure was repeated, and the relationship of the exponent with their coefficients and constants was noted in the form of $[(\Phi)^n=a*(\Phi)+b]$, where n represented the power of (Φ) , The numbers a and b represent constants. It was found that can be used the simple algorithm of the Fibonacci Sequence to find the powers of the irrational number (Φ) . A computer algorithm was later created based in the new calculation of powers of (Φ) . In addition, it was found that the idea can be generalized to any irrational solution of a quadratic equation, which would help in the teaching of Algebra and Number Theory.

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