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, (Phi). 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 (phi) 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 (Phi). It started with the equation [(Phi)^2-(Phi)-1=0)], cleared [(Phi)^2)] and the result was, [(Phi)^2=(Phi) +1], then (Phi) 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 (Phi), 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 (Phi). A computer algorithm was later created based in the new calculation of powers of (Phi). 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.