CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1225

Project Title
How Can It Be Proven That the Fibonacci Sequence Is Related to the Golden Mean?

Abstract

Objectives/Goals
To find, how it is possible to prove that the Fibonacci Sequence and the Golden Mean are indeed related. I hypothesized that my proof would be in showing that there is a horizontal asymptote at y=(1+5^(1/2))/2 for both the graph of f(x)/f(x-1) and the graph of [f(x-1)/f(x)] +1. I also hypothesized that I could show that the individual roots of the equation cancelled out to give (1+5^(1/2))/2 with very large domain values.

Methods/Materials
This project was centered on mathematical trials and analysis, and my materials were limited to pencils, note and graph paper, and a calculator for finding exact values for radicals, etc.
My control was the line y= approx. 1.62, to indicate my hypothetical asymptote. I manipulated the domain, or x, which gave me the values for the respondent range, or y. My graph would represent a series of dots (rather than a defined curve), and I would evaluate the progressive trend of these dots in respect to my set control in order to find the answer to my question.

Results
My data supported my hypothesis, as my resulting graph never touched the line of the Golden Mean. Although it continuously got closer and closer, it never quite reached my imaginary line. Towards thirty, it got so close that the graph became very difficult to draw. The graph had started out wide, but it quickly narrowed in scope and almost resembled a pulse monitor. Also, toward the higher domain values, the decimal seemed to match another digit with each one x increase. For example, 1.612 would hypothetically switch to 1.618, matching another digit with the next domain value. This is also noteworthy, as it shows how quickly the division almost reaches the Golden Mean. Another thing that's very interesting about the whole experiment, is how the Fibonacci Sequence, as it becomes tremendously large, manages to "stick by" this ratio. My results were identical with my second set of experiments, and the asymptote still existed in the exact same place when I took the reciprocal of the equation and added one.

Conclusions/Discussion
By finding the horizontal asymptote, that is the Golden Mean, I could prove its existing relationship with the Fibonacci Sequence. This asymptote ties the two together. It is the Mean, so that is the relationship to that side of the experiment, and it serves as the asymptote for the Fibonacci Sequence.

Summary Statement
Finding different ways to prove that the Fibonacci Sequence and the Golden Mean are related.

Help Received
none