

Exploring Mathematics with Matlab and MuPAD

Sheet 4 Supplementary problems

HT 2018

The Golden Ratio is a number that occurs in nature and art. It is defined as

$$\varphi = \frac{1 + \sqrt{5}}{2}. \quad (1)$$

It is related to the sequence of Fibonacci numbers F_n by taking the limit of ratios of successive Fibonacci numbers,

$$\varphi = \lim_{n \rightarrow \infty} \frac{F_n}{F_{n-1}}. \quad (2)$$

1. Write a function that generates the first n Fibonacci numbers.
2. Using your function for generating the Fibonacci numbers, write a function that outputs the n^{th} approximation to the Golden Ratio.
3. Use this function to compute an approximation to the Golden Ratio with accuracy 10^{-7} . Give your answer as a fraction.
4. Plot a graph of the error of your approximations against n . Your n values should range from $n = 1$ to the value corresponding to the error determined in Q3.