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Homework for

MA 346 Numerical Methods

Spring 2022 — Homework 1

Submit via Canvas before January 30, 2022, 11:59 p.m..

Exercise 1 (Rounding)
Exercises from the book of Burden and Faires: Section 1.2 5(d) (see Example 3), 19(a).

Exercise 2 (Convergence of Algorithms)
Exercises from the book of Burden and Faires: Section 1.3 6(cd), 7(bc).

Exercise 3 (Fibonacci Sequence)
The Fibonacci sequence is given as

$$F_n = F_{n-1} + F_{n-2}$$

with $F_0 = F_1 = 1$ for $n \in \mathbb{N}$.

a) Write a Matlab program fibonacci.m which can be used to calculate the first n Fibonacci numbers. Use a `for` loop.

b) Write a second Matlab program fibonaccivect.m which calculates the the first n Fibonacci numbers in a vectorized manner. To this end use the following formula for the Fibonacci numbers:

$$F_n = \frac{1}{\sqrt{5}} \left(\left(\frac{1+\sqrt{5}}{2} \right)^n - \left(\frac{1-\sqrt{5}}{2} \right)^n \right).$$

c) To validate your code, print for a) and b) F_n/F_{n-1}. In the limit this quotient should approach $(1+\sqrt{5})/2$.

Submit the Matlab files and the output of the ratio F_n/F_{n-1} for a) and b) for $n = 1, \ldots, 30$ (the latter in plain text).