

Exercise 2 (Newton's Method)

- (a) Explain the idea of Newton's method in words. Also provide a formula for one iteration step.
- (b) Let $f(x) = \cos(x)$. Write a Matlab code to approximate the zero $x^* = \frac{\pi}{2}$ of f , which performs N Newton iteration steps.

Exercise 3 (Fixed Point Iteration)

- (a) Write a Matlab code for fixed point iteration, which terminates if either N iteration steps are done or $|x_{n+1} - x_n| < tol$ for a given tolerance tol .
- (b) Improve the convergence rate by providing a formula for Aitken's method (no Matlab code needed here).

Exercise 4 (Polynomial Interpolation)

Let the points $P_1 = (1, -4)$, $P_2 = (2, -3)$, $P_3 = (3, 0)$ be given.

- (a) What is the maximal degree of the unique interpolant p through these points?
- (b) Use the Lagrange form of the interpolant to find the coefficients of p .

Exercise 5 (FFT)

- (a) What does the Matlab function $fft(y)$ compute? Provide a formula.
- (b) How many arithmetic operations are needed? Why?