Numerical Linear Algebra Assignment 13

Exercise 1. (TreBau Exercise 39.1, 10 points)

Exercise 2. (TreBau Exercise 39.2, 10 points)

Exercise 3. (TreBau Exercise 40.1, 10 points)

Compulsory requirement for programming: Use Matlab's `publish` to save all your code, comments, and results to a PDF file. You must use the programming format files: example_format.zip.

Programming 1. (10 points)

Design an algorithm to generate the biorthogonal vectors $\mathbf{w}_i$ and $\mathbf{v}_i$ satisfying

$$\mathbf{w}_i^* \mathbf{v}_j = \delta_{ij}.$$

Provide a numerical example to test your algorithm.

Programming 2. (10 points)

(1) Write matlab code to generate matrices for the cases (a)–(g) in TreBau Exercise 39.5.

(2) Compare CG, GMRES, CGN, and Bi-CG for linear systems with these matrices and right-hand-side $\mathbf{b} = \begin{bmatrix} 1 & \cdots & 1 \end{bmatrix}^\top$.

(3) Explain your numerical results.