Assignment of Report for Lecture 11

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Question 1

Answer The setting follows the description in the slide. Initial values are set to be

$$u^{(0)} = \begin{bmatrix} 0 & \sin\frac{k\pi}{N}, \sin\frac{2k\pi}{N} & \cdots & \sin\frac{(N-1)k\pi}{N} & 0 \end{bmatrix}^{\mathrm{T}}, \tag{1}$$

and only the $N-1$ entries in the middle are updated due to Dirichlet boundary condition. Here we set $N = 64$.

Vectors $u^{(t)}$ after $t = 5$ iterations are shown in Figure 1. The error $\left\|u^{(t)}\right\|_\infty$ is shown in Figure 2.

The codes are implemented in Python and stored in `Problem1.ipynb`.

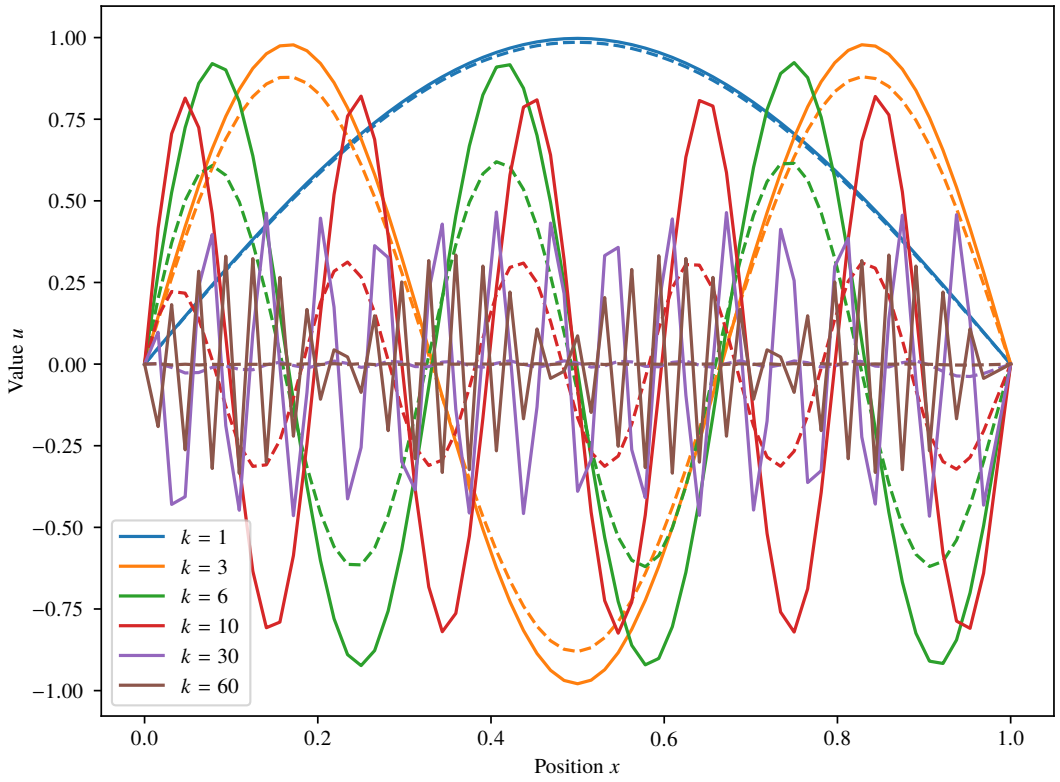

Figure 1 Vectors after $t = 5$ iterations

The original vectors are shown in straight lines, and vectors after $t = 5$ iterations are shown in dashed lines.

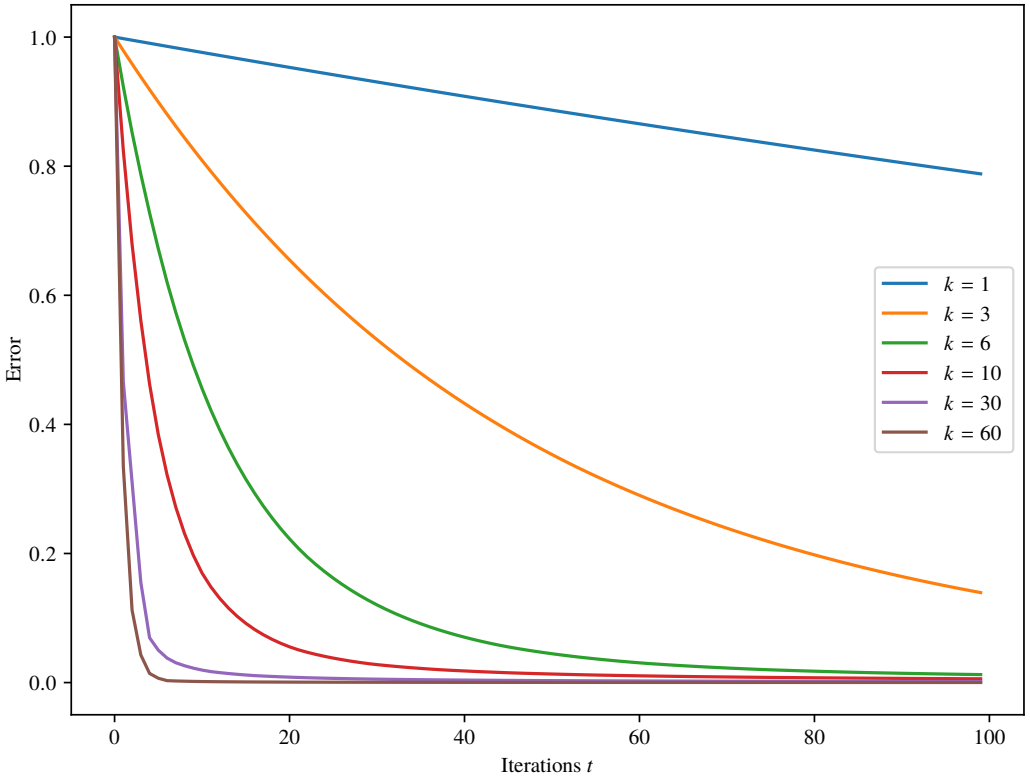

Figure 2 Errors with respect to iterations t