1. Find all solutions (x, y, z, t) to

$$\begin{aligned} x + 2y - 3z &= 4 \\ 2x - y - z &= -2 \\ 5x - 5z &= 0 \end{aligned}$$

2. Find all eigenvalues λ of the matrix

$$\begin{pmatrix} 2 & 2 \\ 1 & 3 \end{pmatrix}$$

and find also all the corresponding eigenvectors.

3. Is there a function $y(x)$ determined by

$$x + y - e^{x-y} = 0$$

on the neighborhood of point $(0, 1)$. If yes, compute $y'\left(\frac{1}{2}\right)$.

4. Find all local maxima and minima of

$$f(x, y) = y^3 + 3x^2y - 15y - 12x.$$

5. Compute

$$\int_M 3x \, \mathrm{d}x\mathrm{d}y$$

where $M = \langle 0, 1\rangle \times \langle 2, 3\rangle$ (i.e., $M = \{(x, y) \in \mathbb{R}^2, x \in \langle 0, 1\rangle, y \in \langle 2, 3\rangle\}$.

6. Find all solutions to a system

$$\mathbf{x}' = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix} \mathbf{x}.$$