Problem 1. *Find a basis for*

(1) *all* 2×2 *matrices with zero trace.*
(2) *all linear functions* $f : \mathbb{R}^3 \to \mathbb{R}$ *with* $f(0) = 0$.
(3) *all linear transforms from* $\mathbb{R}^2$ *to* $\mathbb{R}$.

Problem 2. *Provide complete solutions of the least square problem* $Ax \approx b$ *by using svd of* A *and a basis of null*(A).

Problem 3. *Find all possible det(P) for a projection matrix P.*

Problem 4. *Compute the determinant of*

$$A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 1 \\ 0 & 3 & 1 \end{pmatrix}.$$