1. Solve the system
\[
\begin{align*}
    x + y + z &= 5 \\
    x - y + az &= 3 \\
    2x + y + z &= b
\end{align*}
\]
for all values of the real numbers \(a\) and \(b\).

2. Let \(\ell\) be the line defined by the equations
\[
\ell : \quad x - 2 = \frac{y + 3}{2} = \frac{z - 1}{4}
\]
(a) Find a parametric representation of \(\ell\).
(b) Prove that \(\ell\) is parallel to the plane \(M : 2y - z = 1\).
(c) What is the distance between \(\ell\) and \(M\)?
(ON-system is assumed.)

3. The line \(\ell_0 : (x, y, z) = (3 - t, 2t, 5 - t)\) is projected orthogonally on the plane \(M : x + y + z = 5\); let us denote the projection of \(\ell_0\) by \(\ell\). Find a parametric representation for \(\ell\). (ON-system.)

4. A triangle has two vertices at the points \((1, 0, 1)\) and \((0, 1, 1)\) and the third one on the line \((1, 1, t)\) \((t \in \mathbb{R})\). Express the area of the triangle as a function of \(t\), and find the minimum of that function. (Positive ON-system.)

5. Two vectors \(u, v\) satisfy \(\|u\| = 3, \|v\| = 5\), and \((u|v) = -12\). Compute the number \(\|(3u - 2v) \times (u + 3v)\|\).
(Positive ON-system.)

6. Consider the \(3 \times 3\) matrix
\[
A = \begin{pmatrix}
    1 & 1 & 0 \\
    0 & 1 & 1 \\
    0 & 0 & 1
\end{pmatrix}
\]
(a) Find the inverse \(A^{-1}\).
(b) Compute \(A^2\) and \(A^3\) and \(A^{-2}\). (Here \(A^{-2} = (A^{-1})^2\).)
(c) Try to guess a formula for \(A^k\) for \(k = 1, 2, 3, \ldots\). Use induction to prove the formula.