In problems 1-4 determine the maxima and minima of \( f \) on the surface (or curve).

**Problem 1.**
\( f(x, y, z) = x + y + 2z \) on the surface \( x^2 + y^2 + z^2 = 3 \).

**Problem 2.**
\( f(x, y, z) = xy \) on the curve \( 3x^2 + y^2 = 6 \).

**Problem 3.**
\( f(x, y, z) = x^2 - y^2 \) on the surface \( x^2 + 2y^2 + 3z^2 = 1 \).

**Problem 4.**
\( f(x, y, z) = 8x - 4z \) on the surface \( x^2 + 10y^2 + z^2 = 5 \).

**Problem 5.**
Find minimum of \( \sum_{i=1}^{5} x_i^2 \) subject to constraints \( \begin{cases} \ x_1 + 2x_2 + x_3 = 1 \\ x_3 - 2x_4 + x_5 = 6 \end{cases} \).

**Problem 6.**
Find the extreme values of \( f(x, y) = 2x^2 + 3y^2 - 4x - 5 \) on the region \( x^2 + y^2 \leq 16 \).

**Problem 7.**
What is the smallest possible value of the sum of squares of elements of a matrix from \( SL(2, \mathbb{R}) \)? Find all the matrices where this minimum is attained.

**Problem 8.**
Among all rectangles with diagonal 1 find the one with the largest difference between its area and the square of its smaller side.

**Problem 9.**
Is it true that any compact set \( K \subset \mathbb{R}^2 \) is Riemann measurable (i.e. its boundary is a set of zero measure)?

**Problem 10.**
Is it true that any bounded open set \( U \subset \mathbb{R}^2 \) is Riemann measurable (i.e. its boundary is a set of zero measure)?