Justify every claim formally! Whenever you use a theorem, specify which one you use and explicitly verify that its assumptions are satisfied!

- 1. Express the set $M = \{(x, y, z) : x \sin z + y \cos z = e^z\}$ locally on a neighbourhood of the point a = (2, 1, 0) as a graph of a function f and determine the tangent plane to f at a.
- 2. Find extrema (describe also their type and value) of a function z = z(x, y) determined implicitly by $x^3 y^2 3x + 4y + z^2 + z = 8$.
- 3. Find extrema (describe also their type and value) of the function $f(x, y, z) = xy^2 z^3$ on the set

 $H = \left\{ (x, y, z) \in \mathbb{R}^3 : x + y + z = 12, x > 0, y > 0, z > 0 \right\}.$