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 $M=\left\{(x, y, z): x \sin z+y \cos z=\mathrm{e}^{z}\right\}$ 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 $x^{3}-y^{2}-$ $3 x+4 y+z^{2}+z=8$.
3. Find extrema (describe also their type and value) of the function $f(x, y, z)=x y^{2} z^{3}$ on the set

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

