Maxima, Minima, and Lagrange Multipliers

Problem 1. *Find a function $f\colon \mathbb{R}^2 \to \mathbb{R}$ whose set of critical points is:*

(1) $\mathbb{R}^2$ *(2)* $\{x, y \mid xy = 0\}$ *(3)* $\mathbb{Z} \times \mathbb{Z}$

Problem 2 (Cal Final, Summer 2018W)**.** *Find the minimum and maximum values of the function $f(x, y, z) = x + y + z$ subject to the constraint $x^2 + y^2 + z^2 \leq 10$.*

References

[1] J. Stewart: *Calculus* 8th Edition, Cengage Learning, Boston 2016.