

[11.8] - Lagrange multiplier problems

For each of the following, find the minimum or the maximum of the function f and also give the $x, y, (z, t)$ values at which the minimum or maximum occurs.

1. Find the minimum value of $f(x, y) = x^2 - 8x + y^2 - 12y + 48$ subject to the constraint $x + y = 8$.

minimum value of f :

(x, y) values at which the minimum occurs:

2. Find the minimum value of $f(x, y, z) = 2x^2 + y^2 + 3z^2$ subject to the constraint $2x - 3y - 4z = 49$.

minimum value of f :

(x, y, z) values at which the minimum occurs:

3. Find the maximum value of $f(x, y, z) = xy + yz$ subject to the constraints $\begin{cases} x + 2y = 6 \\ x - 3z = 0 \end{cases}$.

maximum value of f :

(x, y, z) values at which the maximum occurs:

Problem 3: You found the maximum occurred at $6 = xy + yz$. This defines a "contour *surface*" (instead of a contour line). We can graph the intersection of that contour surface with the two constraints (each of which is a *plane*) [here \(in GeoGebra\)](#).