Exercise 1
Use the method of Lagrange multipliers to find the local extreme values (local maxima and local minima) of the function \( f \) subject to the constraint:

(i) \( f(x, y) = xy \) on the ellipse \( x^2 + 4y^2 = 1 \);
(ii) \( f(x, y) = x^2y \) on the line \( x + y = 3 \);
(iii) \( f(x, y) = 2x - y + 6 \) on the circle \( x^2 + y^2 = 4 \);
(iv) \( f(x, y, z) = xyz \) on the plain \( x + y + z = 1 \).
(v) \( f(x, y, z) = x + 2y + 3z \) on the sphere \( x^2 + y^2 + z^2 = 25 \).

Exercise 2
Minimize the function \( f \) subject to two constraints:

(i) \( f(x, y, z) = xyz \) on the intersection of \( x^2 + y^2 - 1 = 0 \) and \( x - z = 0 \);
(ii) \( f(x, y, z) = x^2 + y^2 + z^2 \) on the intersection of \( y + 4z - 4 = 0 \) and \( 4y^2 - z^2 = 0 \).