1) Use Lagrange multipliers to find the maximum and minimum values of the function subject to the given constraint(s).

a) $f(x, y) = x^2 - y^2$, $x^2 + y^2 = 1$

b) $f(x, y, z) = 2x + 6y + 10z$, $x^2 + y^2 + z^2 = 35$

c) $f(x, y, z, t) = x + y + z + t$, $x^2 + y^2 + z^2 + t^2 = 1$

2) Find the extreme values of $f(x, y) = e^{-xy}$ on the region $x^2 + 4y^2 \le 1$.

3) Find the highest point on the curve of intersection of the cone $x^2 + y^2 - z^2 = 0$ and the plane $x + 2z = 4$. [Hint: You are trying to maximize $f(x, y, z) = z$].

4) The sum of the length and the girth (perimeter of a cross section) of a package carried by a delivery service cannot exceed 108 inches. Find the dimensions of the rectangular package of largest volume that may be sent.

5) Use Lagrange multipliers to find the dimensions of a right circular cylinder with volume V_0 cubic units and minimum surface area.