Constrained Extrema
Math 237, Spring 2008

Use the method of Lagrange multipliers to solve each of the following:

(1) Minimize $x^2 + y^2$ on the hyperbola $xy = 1$

(2) Show that the square has largest area of all rectangles with a given perimeter.

(3) Minimize $x^4 + y^4 + z^4$ on the plane $x + y + z = 1$

(4) Maximize $f(x, y, z) = 3x - 2y + z$ on the sphere $x^2 + y^2 + z^2 = 14$

(5) Number 16 in 16.10

(6) Number 14 in 16.10

(7) Show that of all the triangles inscribed in a fixed circle, the equilateral triangle has the largest: (a) product of the lengths of the sides; (b) sum of squares of the lengths of the sides.

(8) Maximize $x^2 + y^2$ on the curve $x^4 + 7x^2y^2 + y^4 = 1$.

(9) A plane passes through the point (a, b, c). Find its intercepts with the coordinate axes if the volume of the solid bounded by the plane is to be at a minimum.