MATH 241 Thomas 13th Edition Name______________

Chapter 14, Section 8

Lagrange multiplier

The extreme values of a function $f(x, y, z)$ whose variables are subject to a constraint $g(x, y, z) = 0$ are found on the surface among the points where for some scalar .

Orthogonal Gradient Theorem

Suppose that $f(x, y, z)$ is differentiable in a region whose interior contains a smooth curve:

If P_0 is a point on the curve where f has a local max or local min relative to its values on the curve then

Suppose $f(x, y, z)$ and $g(x, y, z)$ are differentiable and $\nabla g \neq 0$ when $g(x, y, z) = 0$ then to find the local max and local min values of f subject to the constraints of $g(x, y, z) = 0$, find the values of x, y, z and λ that simultaneously satisfy

Examples:

$f(x, y) = xy,\ g(x, y) = x^2 + y^2 - 10 = 0$

$x^2 y = 2$, nearest the origin

Cylinder in a sphere

$x^2 + y^2 + z^2 = 4$ farthest from the point $(1, -1, 1)$

$x^2 + y^2 + z^2 = 25$ where $f(x, y, z) = x + 2y + 3z$ has its max and min values