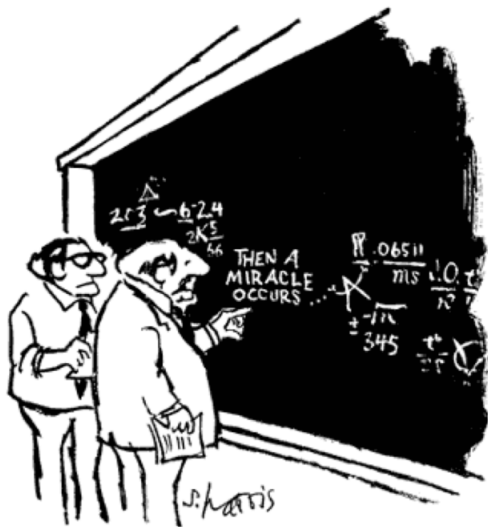


Lagrange Multipliers



"I think you should be more explicit here in step two."

Method of Lagrange

To find the max and min values of $f(x, y, z)$ subject to the constraint $g(x, y, z) = k$ (assuming $\nabla g \neq \mathbf{0}$ and such extreme values exist):

- 1 Find all x, y, z and λ such that

$$\nabla f(x, y, z) = \lambda \nabla g(x, y, z), \text{ and } g(x, y, z) = k.$$

- 2 Evaluate f at all points in (1) - largest is the max and smallest is the min.

More than one constraint

To find the max and min values of $f(x, y, z)$ subject to the constraints $g(x, y, z) = k$ and $h(x, y, z) = c$, we find all x, y, z , λ and μ such that

$$\nabla f(x, y, z) = \lambda \nabla g(x, y, z) + \mu \nabla h(x, y, z), \text{ and}$$

$$g(x, y, z) = k \text{ and } h(x, y, z) = c$$