Multivariable Calculus: Tutorial 1

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February 25, 2019

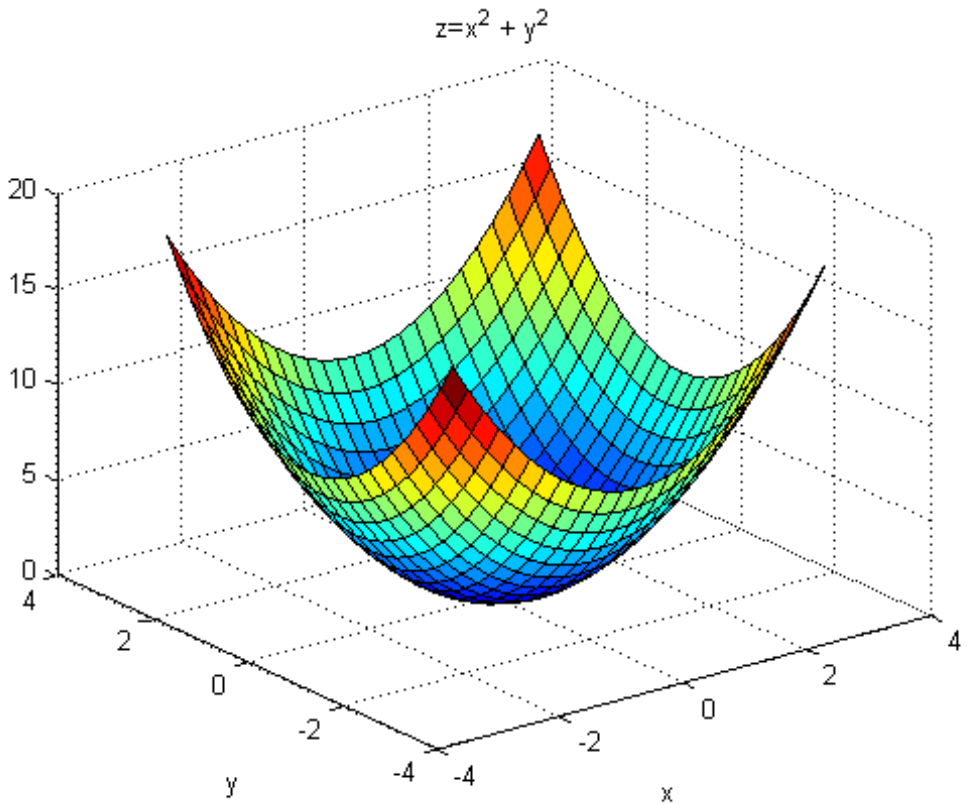
Progress Update

Over the past week I have:

1. Been introduced to functions with 2 inputs & their graphs.
2. Learned about partial derivatives.
3. Minimized & maximized such functions, and identified saddle points.

Multi-variable functions

We are introduced to the namesake of the course; the multi-variable function. Such a function takes in ≥ 2 variables and returns a singular value. Consider the function with 2 inputs $f(x, y) = x^2 + y^2$:



Partial derivatives

Partial derivatives of a function are akin to "normal" derivatives, but we take them along n axes, where n is the count of input variables. The partial derivatives of our paraboloid

$$\frac{\partial f}{\partial x} = 2x$$
$$\frac{\partial f}{\partial y} = 2y$$

where for each we are assuming all the variables we are not interested in at the time to be constant; for example when taking the partial with respect to y one assumes x is constant.

Solving multi-variable equations

Solving a multi-variable equation for where it is maximized/minimized follows a few steps:

1. Find the partial derivatives.
2. Set all equal to zero.
3. Use algebraic techniques to find the inputs where each partial derivative will be equal to zero.
4. Apply second derivative tests to find the kind of critical point found.