

# Lecture on Jul. 6th, 2017: Multivariable Calculus I : Partial Derivatives

## 1 Functions of Several Variables

- Definitions of functions of two variables and functions of three variables.
- Definitions of domain, range of functions of several variables.
- Definition of three-dimensional coordinate system.
- Graphing functions of two variables.
- Example: graph of  $z = f(x, y) = x^2 + y^2$  [paraboloid].

## 2 Partial Derivatives

- Definition of partial derivative.
- Example: Find partial derivative w.r.t.  $x$  of function  $z = f(x, y) = 2x^2 - 3x^2y + 5y + 1$ .
- Geometric interpretations of partial derivatives.
- Definition of second-order partial derivative.
- Note that in our lecture, we always assume  $f_{xy} = f_{yx}$ .