PC1134 Lecture 2

Topic

- Function of more than one varialbles

Objectives

- Understand functions of two or more variables
- Learn how to represent functions of two variables using table, 3D surface and contour graph.

Relevance

- Many physical quantities depend on two or more other quantities and this is why we need to learn partial differentiation of function of more than one variables.

Function of Two Variables

Input: an ordered pair of numbers
Output: a single number

$$z = f(x, y)$$

Examples:

- Isotherm
- Topograhic map
- $PV = nRT$
- Equation for a sphere $x^2 + y^2 + z^2 = 1$

Representation of Function of Two Variables

Functions of two variables can be represented by

- a **Table**

$$z = f(x, y) = x^2 + y^2$$

x	y	$z = f(x, y)$
-1.0	-1.0	2.00
-1.0	-0.5	1.25
-1.0	0.0	1.00
-1.0	0.5	1.25
-1.0	1.0	2.00
-0.5	-1.0	1.25
-0.5	-0.5	0.50
-0.5	0.0	0.25
-0.5	0.5	0.50
-0.5	1.0	1.25
...	...	...

Representation of Function of Two Variables

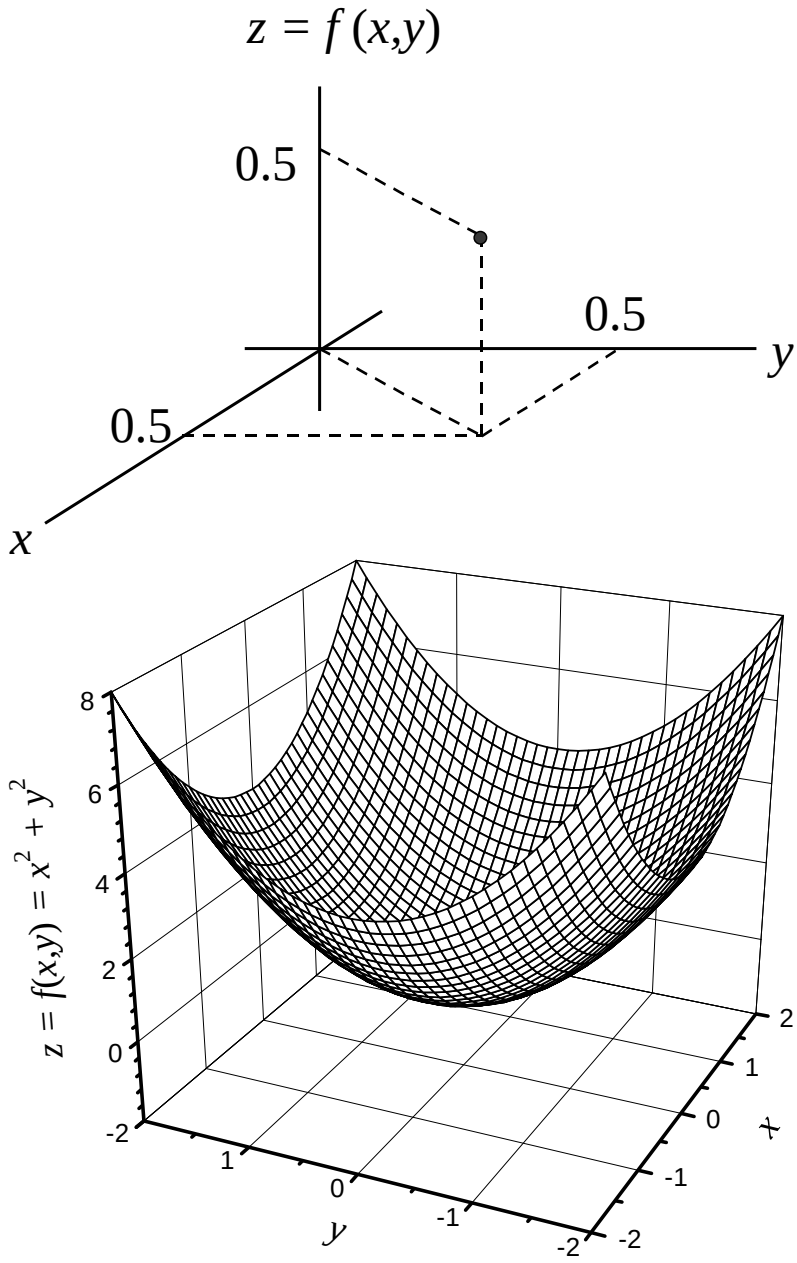
or

$$f(x, y) = x^2 + y^2$$

x \ y	-1.00	**-0.50**	0.00	0.50	1.00
-1.00	2.00	**1.25**	1.00	1.25	2.00
-0.50	1.25	**0.50**	0.25	0.50	1.25
0.00	1.00	**0.25**	0.00	0.25	1.00
0.50	**1.25**	**0.50**	0.25	0.50	1.25
1.00	2.00	1.25	1.00	1.25	2.00

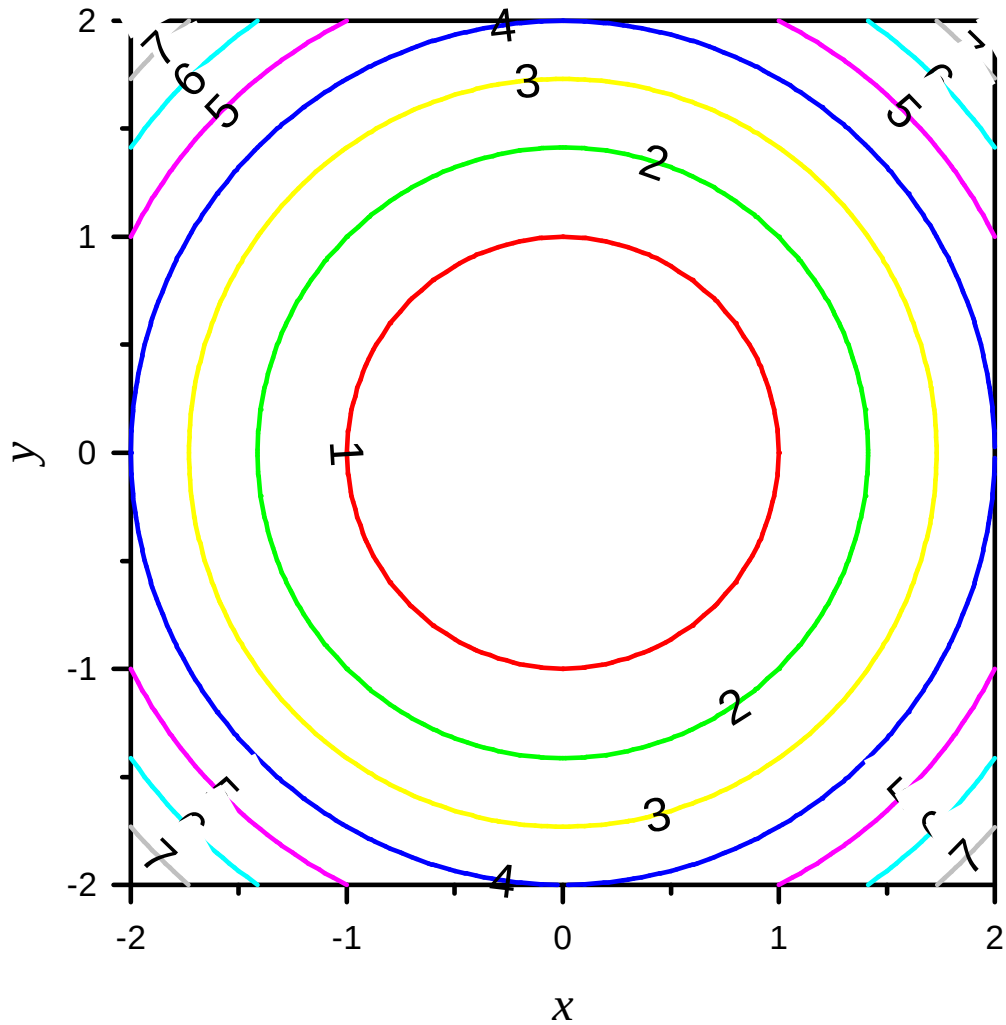
Representation of $f(x, y)$

or a **3D surface**



Representation of $f(x, y)$

or a **Contour plot** (topograhic map)



Representation of $f(x, y)$

A real application (PRB **62**, 13522 (2000)):