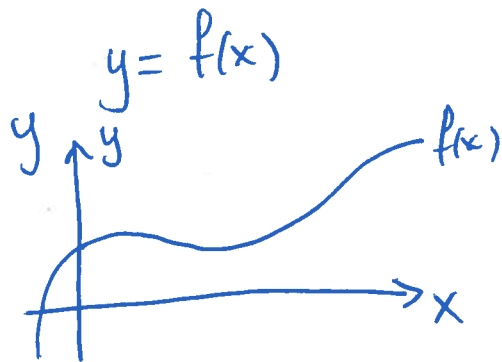


Functions of Several Variables

1D

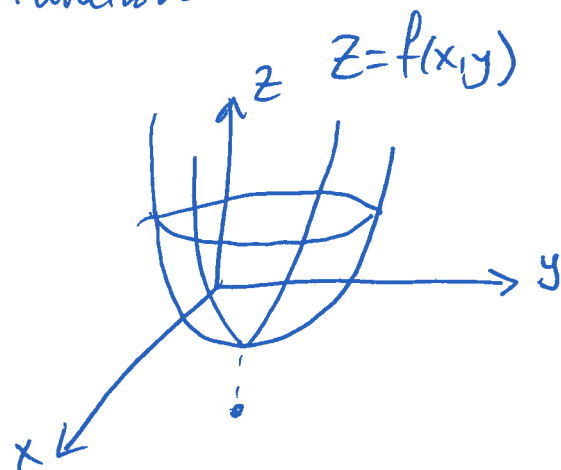
Function of 1 variable



Domain: $D \subseteq \mathbb{R}$

Range: $\{f(x) \mid x \in D\}$

Function of 2 variables



Domain: $D \subseteq \mathbb{R}^2$

Range: $\{f(x, y) \mid (x, y) \in D\}$

Function of n variables

$$y = f(x_1, \dots, x_n)$$

Domain: $D \subseteq \mathbb{R}^n$

Range: $\{f(x_1, \dots, x_n) \mid (x_1, \dots, x_n) \in D\}$

Example

- Climate model

- Cost function

- Topographical map

level curves

Consider $z = f(x, y)$ and K some constant.

$f(x, y) = K$ is ~~the~~^a level curve of f .

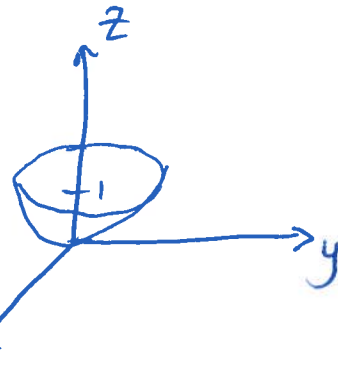
Ex $f(x, y) = x^2 + y^2$

$$\frac{K}{0}$$

$$0 = x^2 + y^2$$

$$\Leftrightarrow x = y = 0$$

level curve
• point



$$1 \quad 1 = x^2 + y^2 \quad \bullet \text{ circle of radius } 1$$

$$r^2 \quad r^2 = x^2 + y^2 \quad \bullet \text{ circle of radius } r$$