For now: focus on scalar-valued functions.

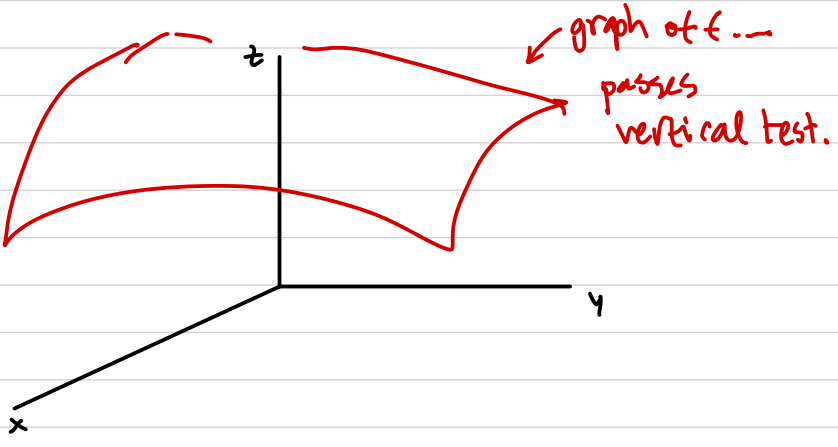
Recall: graphing $f: \mathbb{R} \to \mathbb{R}$ $\rightsquigarrow$ we set $y = f(x)$

↳ similarly, for $f: \mathbb{R}^2 \to \mathbb{R}$ $\rightsquigarrow$ we set $z = f(x,y)$

So, for $f: \mathbb{R}^2 \to \mathbb{R}$, the graph of f is the set

$$\{(x, y, f(x,y)) \mid (x,y) \in \text{domain of } f\} \subset \mathbb{R}^3$$

and we depict it as:



More generally, if $f: \mathbb{R}^m \to \mathbb{R}$ * the graph of f is:

$$\{(\bar{x}, f(\bar{x})) \mid \bar{x} \in \text{domain of } f\} \subset \mathbb{R}^{m+1}.$$

($\bar{x}$ in $\mathbb{R}^m$; $f(\bar{x})$ in $\mathbb{R}$)

Q: How to draw graph $f: \mathbb{R}^2 \to \mathbb{R}$?

↳ tool: level/contour curves.

(these have theoretical value beyond graphing.)