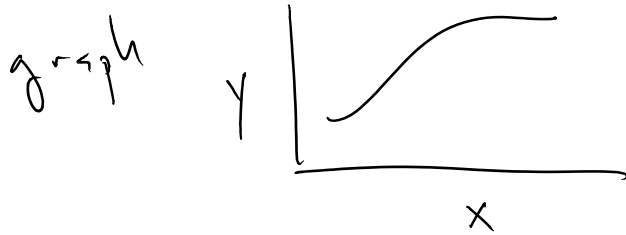


Lecture 35: vectors and functions in higher dimensions

Wednesday, November 19, 2014 12:27 PM

functions so far have been of the form

$$f: \underset{x}{\mathbb{R}} \rightarrow \underset{y}{\mathbb{R}} \quad \text{takes a real \# , gives a real \#}$$

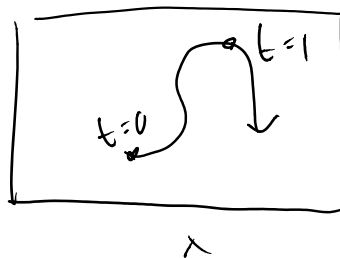
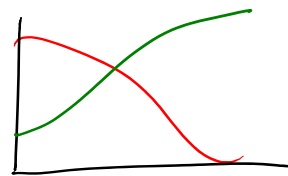


$$f: \underset{t}{\mathbb{R}} \rightarrow \underset{x}{\mathbb{R}} \quad \text{trajectory of particle moving on a line.}$$

$$f: \mathbb{R} \rightarrow \mathbb{R}^2 \quad (\text{two graphs})$$

$$\# \rightsquigarrow 2\# \text{'s}$$

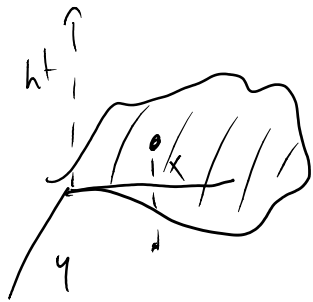
$$t \mapsto x, y$$



"parametric curve"

$$f: \mathbb{R}^2 \rightarrow \mathbb{R}$$

$x, y \mapsto \text{height}$



$$f: \mathbb{R}^3 \rightarrow \mathbb{R}$$

$(x, y, z) \mapsto \text{temperature}$

$$f: \mathbb{R} \rightarrow \mathbb{R}^3$$

$t \mapsto (x, y, z)$

trajectory in space.

$$f: \mathbb{R}^3 \rightarrow \mathbb{R}^3$$

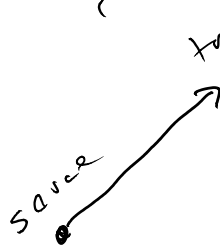
wind
 $(x, y, z) \mapsto \text{direction, intensity} = f \text{ wind}$

vector x, y, z

Vectors:

"Magnitude & Direction"

(3-Dimensional)



no fixed starting pt.

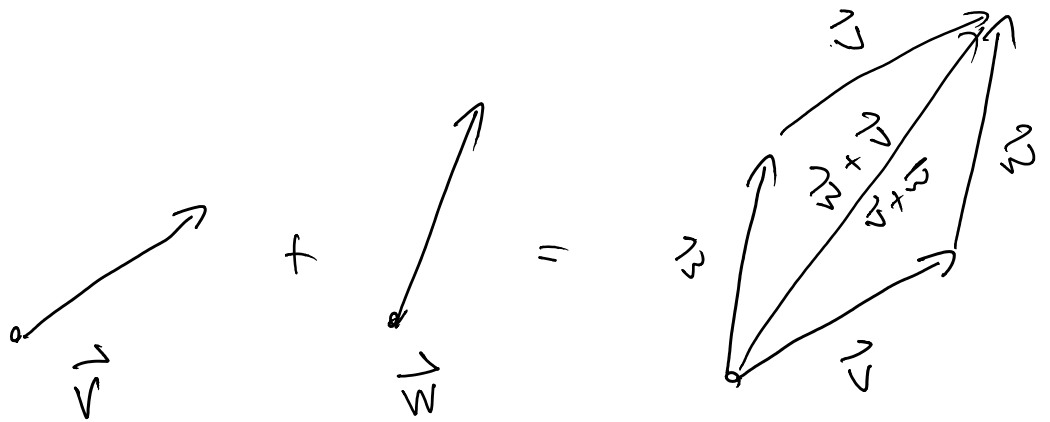
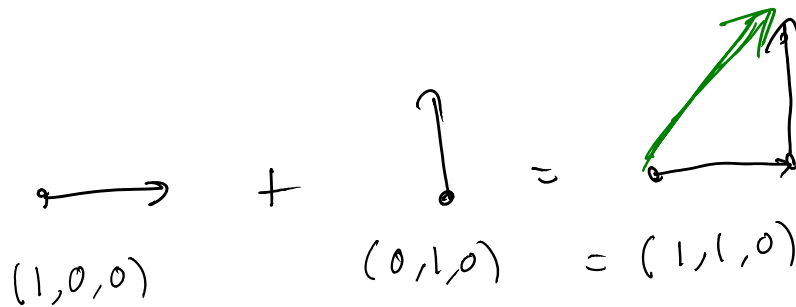
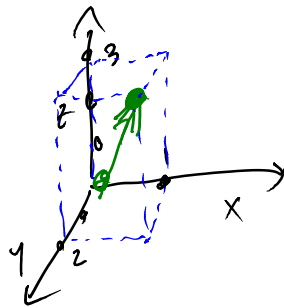
"Standard position" starts at origin

only one short target = point in 3-dim'd

unit -

space
= 3 numbers (x, y, z)

(1, 2, 3)



or - add up the entries

$$\vec{v} = (a, b, c) \quad \vec{w} = (d, e, f)$$

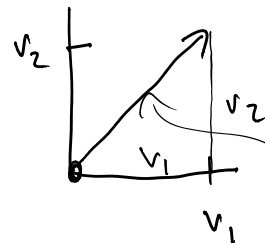
$$\vec{v} + \vec{w} = (a+d, b+e, c+f)$$

length $|\vec{v}|$

2-dimension

$$\vec{v} = (v_1, v_2)$$

\nearrow \uparrow
x y



$$|\vec{v}| = \sqrt{v_1^2 + v_2^2}$$

3-dim

$$|\vec{v}| = \sqrt{v_3^2 + (\sqrt{v_1^2 + v_2^2})^2}$$

$$\vec{v} = (v_1, v_2, v_3)$$

$$|\vec{v}| = \sqrt{v_1^2 + v_2^2 + v_3^2}$$