# Vector Spaces

## Definition of Vector Spaces

$(S, \oplus, \otimes, \vec{0_s})$

Let $\vec{S_1}, \vec{S_2} \in S$
If:

- Closed under $\oplus$ $(S_1 + S_2 \in S)$
- Closed under $\otimes$ $(\lambda S_1 \in S)$
- $\vec{O_s} + \cancel{x} = \cancel{x}$

Then $(S, \oplus, \otimes, \vec{0_s})$ is a vector space.

## Another Example

($R^+$, 'x' (usual multiplication, used as vector addition), exp (scalar multiplication), 1)

Take $x, y \in R^+$

- $x \oplus y = xy \in R^+$
- $\lambda \otimes x = x^\lambda \in R^+$
- $1 \oplus x = x \in R^+$

## Another example 2

$a_0 + a_1 x + a_2 x^2 + \ldots + a_n x^n$

$(P, +, \times, 0)$