Linear Mapping

The rules

$(V, \oplus_v, \otimes_v, \vec{O_v})$

$(W, \oplus_w, \otimes_w, \vec{O_w})$

$\vec{u} \in V$ maps through f into $\vec{w} \in W$

Let $\vec{v_1}, \vec{v_2} \in V$

If

1. $f(\vec{v_1} \oplus_v \vec{v_2}) = f(\vec{v_1}) \oplus_w f(\vec{v_2})$
2. $f(\lambda \otimes_v \vec{v_1}) = \lambda \otimes_w f(\vec{v_1})$

Then, f is a linear mapping

Example

$P = \{a_0 + a_1x + \ldots . a_nx^n : n \in N \cup \{0\}, a_i \in R\}$

$(P, +, \times, 0)$ = vector space

$f : P \to P$
if $p \in P$, then $f(p) = (1 + x^2)\vec{p}$

Is f a linear mapping?

Let $\vec{p_1}, \vec{p_2} \in P$

$f(p_1 + p_2) = (1 + x^2)((p_1 + p_2)) = (1 + x^2)(p_1) + (1 + x^2)(p_2) = f(p_1) + f(p_2) =$
Works
Do same for x
F is a linear mapping.