Linear Algebra - bb192909-f32a-48a0-93d4-76820ea00342

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This is not an isomorphism since it is not one-to-one. For instance, both $\vec{0}$ and $\vec{e}_3$ in $\mathbb{R}^3$ map to the zero vector in $\mathbb{R}^2$.

1.3 Example The domain and codomain can be other than spaces of column vectors. Both of these are homomorphisms; the verifications are straightforward.

(1) $f_1 : \mathcal{P}_2 \to \mathcal{P}_3$ given by

$$a_0 + a_1x + a_2x^2 \mapsto a_0x + (a_1/2)x^2 + (a_2/3)x^3$$

(2) $f_2 : M_{2\times 2} \to \mathbb{R}$ given by

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \mapsto a + d$$

1.4 Example Between any two spaces there is a *zero homomorphism*, mapping every vector in the domain to the zero vector in the codomain.

1.5 Example These two suggest why we use the term 'linear map'.

(1) The map $g : \mathbb{R}^3 \to \mathbb{R}$ given by

$$\begin{pmatrix} x \end{pmatrix}$$

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