7.3.2 Back to Linear Transformations

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Week 7 due Nov 20, 2023 01:42 IST Completed

7.3.2 Back to Linear Transformations

Video

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Dr. Robert van de Geijn: So now we're ready to start

talking about how to invert linear transformations and the matrices that

represent those linear transformations.

So let's start by extending the notion of the inverse of a function

from functions that map R to R to vector functions.

0:00 / 0:00 2.0x

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Reading Assignment

0 points possible (ungraded)

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Calculator

Homework 7.3.2.1

1/1 point (graded)

Let $L : \mathbb{R}^n \rightarrow \mathbb{R}^n$ be a linear transformation that is a bijection and let L^{-1} denote its inverse.

L^{-1} is a linear transformation.

Always ✔ Answer: Always

Answer: Always

Let $x, y \in \mathbb{R}^n$ and $\alpha \in \mathbb{R}$.

- $L^{-1}(\alpha x) = \alpha L^{-1}(x)$. Let $u = L^{-1}(x)$. Then $x = L(u)$. Now,

$$L^{-1}(\alpha x) = L^{-1}(\alpha L(u)) = L^{-1}(L(\alpha u)) = \alpha u = \alpha L^{-1}(x).$$

- $L^{-1}(x+y) = L^{-1}(x) + L^{-1}(y)$. Let $u = L^{-1}(x)$ and $v = L^{-1}(y)$ so that $L(u) = x$ and $L(v) = y$. Now,

$$L^{-1}(x+y) = L^{-1}(L(u) + L(v)) = L^{-1}(L(u+v)) = u + v = L^{-1}(x) + L^{-1}(y).$$

Hence L^{-1} is a linear transformation.

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Answers are displayed within the problem

Video

Start of transcript. Skip to the end.

Dr. Robert van de Geijn: Hopefully you went ahead and did the homework.

If not then I'm going to explain it to you now.

It turns out that L inverse is itself always a linear transformation.

And how do we prove that?

We always start with arbitrary x and y, and arbitrary alpha.

0:00 / 0:00 2.0x

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Homework 7.3.2.2

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