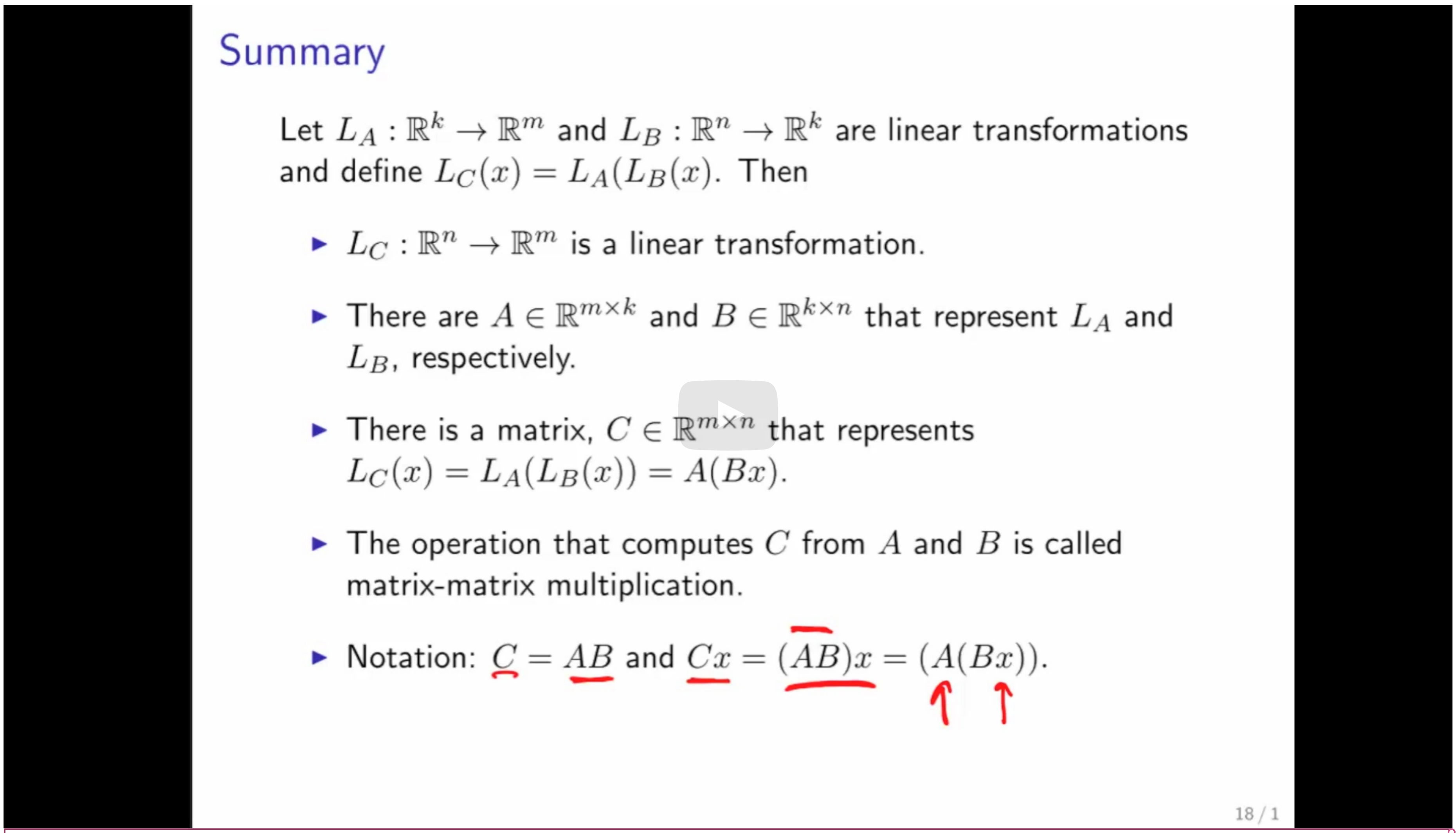
4.4.2 Linear Transformations to Matrix-Matrix Multiplication

Bookmark this page

Week 4 due Oct 24, 2023 19:42 IST Completed

4.4.2 Linear Transformations to Matrix-Matrix Multiplication



▶ 6:16 / 6:16 2.0x

Video

Download video file

Transcripts

Download SubRip (.srt) file
Download Text (.txt) file

Reading Assignment

0 points possible (ungraded)

Read Unit 4.4.2 of the notes. [LINK]

☑ Done

Submit

✔ Correct

Discussion

Hide Discussion

Topic: Week 4 / 4.4.2

Calculator

Show all posts by recent activity

There are no posts in this topic yet.

✖

Homework 4.4.2.1

1/1 point (graded)

Let $L_A : \mathbb{R}^k \to \mathbb{R}^m$ and $L_B : \mathbb{R}^n \to \mathbb{R}^k$ both be linear transformations and, for all $x \in \mathbb{R}^n$, define the function $L_C : \mathbb{R}^n \to \mathbb{R}^m$ by $L_C(x) = L_A(L_B(x))$.

L_C is a linear transformation.

Always ✔ Answer: Always

Explanation

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

$$\begin{aligned} L_C(\alpha x) &= L_A(L_B(\alpha x)) \\ &= L_A(\alpha L_B(x)) \\ &= \alpha L_A(L_B(x)) \\ &= \alpha L_C(x) \end{aligned}$$

$$\begin{aligned} L_C(x+y) &= L_A(L_B(x+y)) \\ &= L_A(L_B(x) + L_B(y)) \\ &= L_A(L_B(x)) + L_A(L_B(y)) \\ &= L_C(x) + L_C(y) \end{aligned}$$

This proves that L_C is a linear transformation by showing that L_C has all the properties of a linear transformation. This proof simply states that the composition of two linear transformations is itself a linear transformation.

Submit

Answers are displayed within the problem

Homework 4.4.2.2

1/1 point (graded)

Let $A \in \mathbb{R}^{m \times n}$. $A^T A$ is well-defined. (By well-defined we mean that $A^T A$ makes sense. In this particular case this means that dimensions of A^T and A are such that $A^T A$ can be computed.)

Always ✔ Answer: Always

Explanation

Answer: Always A^T is $n \times m$ and A is $m \times n$, and hence the column size of A^T matches the row size of A.

Submit

Answers are displayed within the problem

Homework 4.4.2.3

1/1 point (graded)

Let $A \in \mathbb{R}^{m \times n}$. AA^T is well-defined.

Always ✔ Answer: Always

Calculator

Explanation

Answer: Always

Apply the result in the last exercise, with A replaced by A^T.

Submit

Answers are displayed within the problem

Previous Next

Calculator