UTAustinX UT.5.05x
Linear Algebra - Foundations to Frontiers

Help

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Course   Progress   Dates   Discussion   Syllabus   Outline   laff routines   Community

🏠 Course / Week 4: Matrix-Vector to Matrix-Matrix Multiplication / 4.2 Preparation

Previous   Next

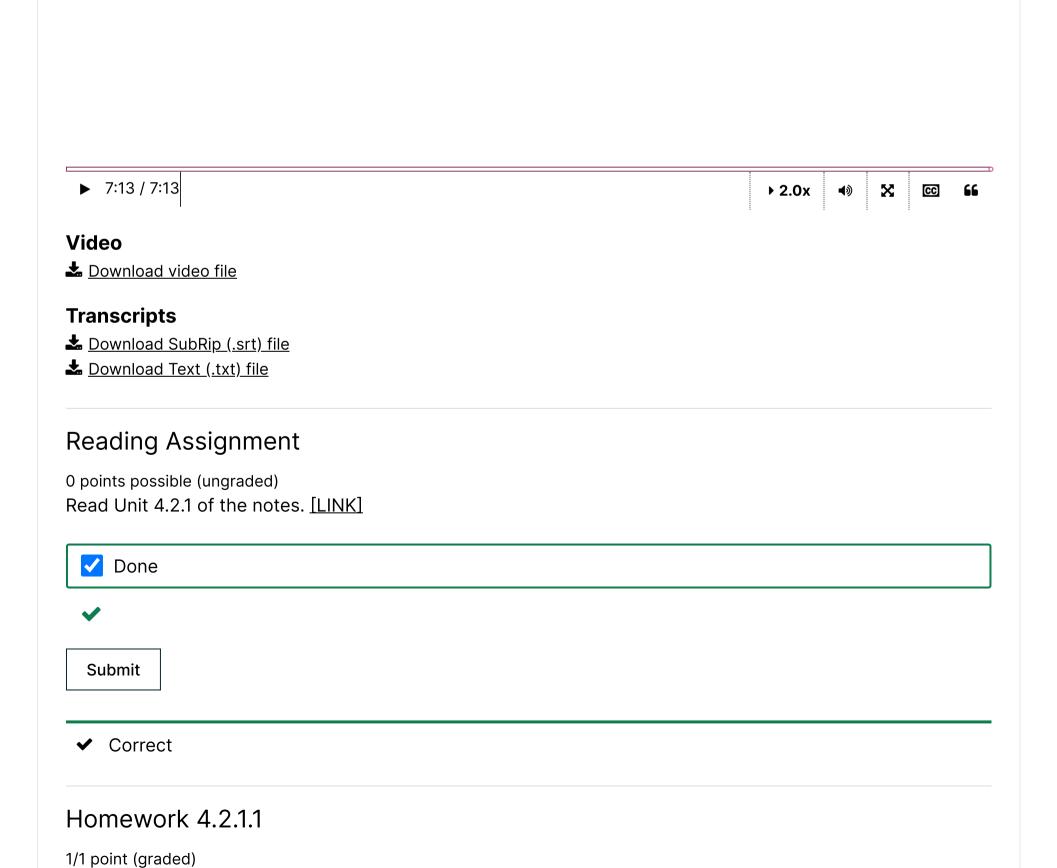## 4.2.1 Partitioned Matrix-vector Multiplication

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Calculator

Week 4 due Oct 24, 2023 19:42 IST

4.2.1 Partitioned Matrix-Vector Multiplication

▶   7:13 / 7:13   ▸ 2.0x   🔊   ⤢   CC   ❝

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Reading Assignment

0 points possible (ungraded)
Read Unit 4.2.1 of the notes. [LINK]

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✔

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Homework 4.2.1.1

1/1 point (graded)
Consider

$$\begin{pmatrix} -1 & 2 & 4 & 1 & 0 \end{pmatrix} \qquad \begin{pmatrix} 1 \end{pmatrix}$$

🖩 Calculator

$$A = \begin{pmatrix} -1 & 2 & 4 & 1 & 0 \\ 1 & 0 & -1 & -2 & 1 \\ 2 & -1 & 3 & 1 & 2 \\ 1 & 2 & 3 & 4 & 3 \\ -1 & -2 & 0 & 1 & 2 \end{pmatrix} \quad \text{and} \quad x = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix},$$

and partition these into submatrices (regions) as follows:

$$\left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array} \right) \quad \text{and} \quad \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array} \right),$$

where $A_{00} \in \mathbb{R}^{3x3}$, $x_0 \in \mathbb{R}^3$, α_{11} is a scalar, and χ_1 is a scalar. Show with lines how A and x are partitioned:

○
$$\left(\begin{array}{cc|cc|c} -1 & 2 & 4 & 1 & 0 \\ 1 & 0 & -1 & -2 & 1 \\ \hline 2 & -1 & 3 & 1 & 2 \\ \hline 1 & 2 & 3 & 4 & 3 \\ -1 & -2 & 0 & 1 & 2 \end{array} \right), \quad \left(\begin{array}{c} 1 \\ 2 \\ \hline 3 \\ \hline 4 \\ 5 \end{array} \right)$$

○
$$\left(\begin{array}{c|c|ccc} -1 & 2 & 4 & 1 & 0 \\ \hline 1 & 0 & -1 & -2 & 1 \\ 2 & -1 & 3 & 1 & 2 \\ 1 & 2 & 3 & 4 & 3 \\ \hline -1 & -2 & 0 & 1 & 2 \end{array} \right), \quad \left(\begin{array}{c} 1 \\ \hline 2 \\ 3 \\ 4 \\ \hline 5 \end{array} \right)$$

◉
$$\left(\begin{array}{ccc|c|c} -1 & 2 & 4 & 1 & 0 \\ 1 & 0 & -1 & -2 & 1 \\ 2 & -1 & 3 & 1 & 2 \\ \hline 1 & 2 & 3 & 4 & 3 \\ \hline -1 & -2 & 0 & 1 & 2 \end{array} \right), \quad \left(\begin{array}{c} 1 \\ 2 \\ 3 \\ \hline 4 \\ \hline 5 \end{array} \right)$$

○ Not enough information

✔

Explanation
Answer:
$$\left(\begin{array}{ccc|c|c} -1 & 2 & 4 & 1 & 0 \\ 1 & 0 & -1 & -2 & 1 \\ 2 & -1 & 3 & 1 & 2 \end{array} \right) \left(\begin{array}{c} 1 \\ 2 \\ 3 \end{array} \right).$$

‹ Previous   Next ›

▦ Calculator

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