

Optimization Theory (DS2) HW#1

Basic Matrix and Vector Operations

April 12, 2017

Alice laughed. "There's no use trying," she said: "one can't believe impossible things."

"I daresay you haven't had much practice," said the Queen. "When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast."

Lewis Carroll, *Through the Looking Glass*, 1871

1. Download and install the programming language R, if you don't have it. Show me that it works (e.g., submit a screen shot showing it running). You can find R at <https://www.r-project.org/>.

2. Write out the transpose of the row vector $(0 \ 1 \ 2)^T$ as a column vector.

3. Add the two vectors

$$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 3 \\ 5 \\ 7 \\ 11 \end{pmatrix} =? \quad (1)$$

4. Calculate the dot product of the two vectors

$$(1 \ 2 \ 3 \ 4) (4 \ 3 \ 2 \ 1)^T =? \quad (2)$$

5. Multiply this vector and matrix

$$\begin{pmatrix} 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 4 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \\ 3 \\ 2 \end{pmatrix} =? \quad (3)$$

6. Multiply these matrices

$$\begin{pmatrix} 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 4 & 0 & 0 & 1 \\ 3 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 5 & 1 & 0 & 0 \\ 6 & 0 & -1 & 0 \\ 7 & 0 & 0 & 1 \\ 8 & 0 & 0 & -1 \end{pmatrix} =? \quad (4)$$