Pima2024

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Contents

1 Problem Description

1.1 Problem 1

Render the matrix below:

$$
\begin{array}{c:ccc:c}
 & \overset{\times d}{\mathbf{t}} & \overset{\times d}{\mathbf{w}} & \overset{\times 1}{w_0} & \\
\hdashline
\times d & -\mathbb{I}_d & -\mathbb{I}_d & (\mathbf{0})_d & (\mathbf{0})_d \\
\hdashline
\times d & -\mathbb{I}_d & \mathbb{I}_d & (\mathbf{0})_d & (\mathbf{0})_d \\
\hdashline
\times n & (\mathbf{0})_{n\times d} & \begin{matrix} -y_1\mathbf{x}_1^T \\ -y_2\mathbf{x}_2^T \\ \vdots \\ -y_n\mathbf{x}_n^T \end{matrix} & -\mathbf{y} & -\mathbf{y}
\end{array}
$$

Hints:

- Use `\array` or `\tabular` instead of normal matrices commands for easy aligning.
- Use `\scriptstyle` for small text in math mode. Can be used for $\times d$, $\times n$ and $\times 1$.

1.2 Problem 2

Render the matrix below:

$$
\begin{array}{c:cccc:cccc:c:c}
 & \overset{1}{t_1} & t_2 & \cdots & \overset{d}{t_d} & \overset{d+1}{w_1} & w_2 & \cdots & \overset{2d}{w_d} & \overset{2d+1}{w_0} & & \\
\hdashline
1 & -1 & 0 & \cdots & 0 & -1 & 0 & \cdots & 0 & 0 & & 0 \\
 & 0 & -1 & \cdots & 0 & 0 & -1 & \cdots & 0 & 0 & & 0 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & & \vdots \\
d & 0 & 0 & \cdots & -1 & 0 & 0 & \cdots & -1 & 0 & & 0 \\
\hdashline
d+1 & -1 & 0 & \cdots & 0 & 1 & 0 & \cdots & 0 & 0 & & 0 \\
 & 0 & -1 & \cdots & 0 & 0 & 1 & \cdots & 0 & 0 & & 0 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & & \vdots \\
2d & 0 & 0 & \cdots & -1 & 0 & 0 & \cdots & 1 & 0 & & 0 \\
\hdashline
2d+1 & 0 & 0 & \cdots & 0 & -y_1x_{1,1} & -y_1x_{1,2} & \cdots & -y_1x_{1,d} & -y_1 & & -y_1 \\
 & 0 & 0 & \cdots & 0 & -y_2x_{2,1} & -y_2x_{2,2} & \cdots & -y_2x_{2,d} & -y_2 & & -y_2 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & & \vdots \\
2d+n & 0 & 0 & \cdots & 0 & -y_nx_{n,1} & -y_nx_{n,2} & \cdots & -y_nx_{n,d} & -y_n & & -y_n
\end{array}
$$

1.3 Problem 3

Try to scale the matrix in Problem 2 to 75% of the text width.

$$
\begin{array}{c|cccc|cccc|c|}
 & \overset{1}{t_1} & t_2 & \cdots & \overset{d}{t_d} & \overset{d+1}{w_1} & w_2 & \cdots & \overset{2d}{w_d} & \overset{2d+1}{w_0} \\
\hline
{\scriptstyle 1} & -1 & 0 & \cdots & 0 & -1 & 0 & \cdots & 0 & 0 \\
 & 0 & -1 & \cdots & 0 & 0 & -1 & \cdots & 0 & 0 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\
{\scriptstyle d} & 0 & 0 & \cdots & -1 & 0 & 0 & \cdots & -1 & 0 \\
\hline
{\scriptstyle d+1} & -1 & 0 & \cdots & 0 & 1 & 0 & \cdots & 0 & 0 \\
 & 0 & -1 & \cdots & 0 & 0 & 1 & \cdots & 0 & 0 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\
{\scriptstyle 2d} & 0 & 0 & \cdots & -1 & 0 & 0 & \cdots & 1 & 0 \\
\hline
{\scriptstyle 2d+1} & 0 & 0 & \cdots & 0 & -y_1x_{1,1} & -y_1x_{1,2} & \cdots & -y_1x_{1,d} & -y_1 \\
 & 0 & 0 & \cdots & 0 & -y_2x_{2,1} & -y_2x_{2,2} & \cdots & -y_2x_{2,d} & -y_2 \\
 & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\
{\scriptstyle 2d+n} & 0 & 0 & \cdots & 0 & -y_nx_{n,1} & -y_nx_{n,2} & \cdots & -y_nx_{n,d} & -y_n
\end{array}
\qquad
\begin{bmatrix} 0 \\ 0 \\ \vdots \\ 0 \\ 0 \\ 0 \\ \vdots \\ 0 \\ -y_1 \\ -y_2 \\ \vdots \\ -y_n \end{bmatrix}
$$