Linear Algebra Commands in LaTeX

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1   Vectors and Matrices in LaTeX

Vectors can be written in LaTeXby using the command \vec{ }. For example,

\vec{v} \times \vec{u}

compiles as

$$\vec{v} \times \vec{u}.$$

Vectors and matrices can be written explicitly using the *array environment*. Array environments may only be used in math mode. The set up is as follows:

\begin{array}{cols} row 1 \\ row 2 \\ ...\\ row n \end{array}

where *cols* is a list of characters of the form r, c, or l, representing the alignment of each column as right, center, or left. The character | can be inserted in-between to give vertical lines between columns. The cells in each row are separated by &. For example,

```
\left( \begin{array}{cc}
1 & 1 \\
g_x(x,y) & 1 + g_y(x,y)
\end{array} \right)
\mbox{~and~}
\left[ \begin{array}{cc|r}
3 & 4 & 5 \\
1 & 3 & 729
\end{array} \right].
```

compiles as

$$\begin{pmatrix} 1 & 1 \\ g_x(x,y) & 1 + g_y(x,y) \end{pmatrix} \text{ and } \left[\begin{array}{cc|r} 3 & 4 & 5 \\ 1 & 3 & 729 \end{array} \right].$$

Notice that wrapping the array environment with \right(... \left) puts parentheses around the matrix. The parentheses will be sized automatically by LaTeX. If your matrix contains negative numbers (or numbers that have a differing number of digits) it is recommended to align them to the right.

2 Cases

The array environment can also be used to create cases. For example,

```
\left\{ \begin{array}{rcl}
x^2 - 4x + 1 & \mbox{for} & 0 < x \le 3 \\
12 - x & \mbox{for} & 3 < x < \infty
\end{array} \right. .
```

compiles as

$$\left\{ \begin{array}{rcl} x^2 - 4x + 1 & \text{for} & 0 < x \le 3 \\ 12 - x & \text{for} & 3 < x < \infty \end{array} \right. .$$

Notice that `\left(` is enclosed by `\right.` - you need close every `\left` with a `\right`. If you do not want anything to appear, use `\right.`. The period suppresses any output.

3 Practice

Create the following text.

Define $T : \mathbb{R}^2 \to \mathbb{R}^2$ by

$$T \begin{pmatrix} x \\ y \end{pmatrix} := \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0 \\ g(x, y) \end{pmatrix}$$

where

$$g(x, y) := \left\{ \begin{array}{rcl} f(x, y) & \text{for} & (x, y) \in B(\vec{0}, \epsilon) \\ 0 & \text{for} & (x, y) \notin B(\vec{0}, \epsilon) \end{array} \right. .$$