LESSON 2: Array and Matrix

Here is the standard latex syntax for an array:

`\begin{array}[pos]{preamble}  row-list  \end{array}`

The optional arguments `[pos]` can be **c, t, b** and it is almost never used. The {preamble} determines whether columns are *centered, c, left-justified, l* or *right-justified, r.*

In order to put some kind of border around an array you must use the `\left` and `\right` commands.

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Many types of borders are available:

$$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}, \quad f(x) = \begin{cases} -1, & x < 0 \\ 1, & x \geq 0 \end{cases}$$

Personally I prefer to use the AMSMATH package and the matrix command:

1. `\begin{matrix} row-list \end{matrix}` : $\begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix}$

2. `\begin{bmatrix} row-list \end{bmatrix}` : $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

3. `\begin{pmatrix} row-list \end{pmatrix}` : $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

4. `\begin{vmatrix} row-list \end{vmatrix}` : $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$

5. `\begin{Vmatrix} row-list \end{Vmatrix}` $\begin{Vmatrix} 1 & 2 \\ 3 & 4 \end{Vmatrix}$

Note that any mathematical expressions can be the entries

$$\begin{bmatrix} \int_0^1 e^x \cos(x)\, dx & (x^2+1) & \cdots & \frac{d}{dx}\sin^2(x) \\ a_1^2 & \sqrt[4]{x^2+2} & \cdots & 1 \\ \vdots & \ddots & \ddots & 0 \\ 1 & 2 & \cdots & 4 \end{bmatrix}$$

PROBLEM: Write a correct LaTeX syntax to build a Vandermode matrix with a square brackets for borders and with first row $1, 1, 1, \cdots, 1$, second row $x_1, x_2, x_3, \cdots, x_n$ and third row $x_1^2, x_2^2, x_3^2, \cdots, x_n^2$, a row with vertical and diagonal dots and finally a fourth row with $x_1^{n-1}, x_2^{n-1}, x_3^{n-1}, \cdots, x_n^{n-1}$.