LaTeX Workshop

How To Write Mathematical Expression

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Overview

1. Mathematical Expression

Mathematical Expression

Introduction

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We know Pythagorean theorem $x^2 + y^2 = z^2$ was proved to be invalid for other exponents, that is, following equation has no integer solutions:

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Allignment

Put equations on a separate line with the `equation*` environment.

When you will put `equation*` no equation number will appear

$$e^{\pi i} + 1 = 0$$

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\end{equation*}
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\end{equation*}
```

You can break into multiple lines.

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$$

```
\begin{multline*}
  \sin (x)=x-\frac{x^3}{3!} \\
      +\frac{x^5}{5!}-\cdots
\end{multline*}
```

Allignment

Align using the `eqnarray*` environment

$$
\begin{aligned}
z_0 &= d = 0 \\
z_{n+1} &= z_n^2 + c
\end{aligned}
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\end{eqnarray*}
```

(you can have an empty left or right side of the alignment).

- `&` operator use to specify alignment.
- `&` operator can not be used in `$ $` mode and `\[ \]`
- Atmost two alignment option can be used in `eqnarray` in each line.

Allignment

Align using the `align*` environment (`&` operator use to specify alignment and you can use as many as you want alignment option in each line)

$$x = y \qquad w = z \qquad a = b + c$$
$$2x = -y \qquad 3w = \frac{1}{2}z \qquad a = b$$
$$-4 + 5x = 2 + y \qquad w + 2 = -1 + w \qquad ab = cb$$

Code:

```
\begin{align*}
x&=y            &  w &=z                  &  a&=b+c\\
2x&=-y          &  3w&=\frac{1}{2}z       &  a&=b\\
-4 + 5x&=2+y    &  w+2&=-1+w              &  ab&=cb
\end{align*}
```

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- _ ^ Subscripts and superscripts.

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$$\int_0^1 x^2 + y^2 \, dx$$

$$a_1^2 + a_2^2 = a_3^2$$

$$x^{2\alpha} - 1 = y_{ij} + y_{ij}$$

$$(a^n)^{r+s} = a^{nr+ns}$$

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a_1^2 + a_2^2 = a_3^2  \\
x^{2 \alpha} - 1 = y_{ij} + y_{ij}\\
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\end{align*}
```

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\[ \sum_{i=1}^{\infty} \frac{1}{n^s}
= \prod_p \frac{1}{1 - p^{-s}} \]
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- adding `\displaystyle` beforehand will make the symbol large and easier to read.

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Try the following code

```
$\displaystyle\int\frac{1}{2}dx -
\int\frac{1}{2}dx$\\
$\int\frac{1}{2}dx -
\mathlarger{ \int\frac{1}{2}dx}$
```

Brackets and Parentheses

- { } these parentheses is reserved for latex compiler. To get those parenthesis you have to use \{ \} .

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$$\left\{ \begin{array}{ccc} 1 & 5 & 8 \\ 0 & 2 & 4 \\ 3 & 3 & -8 \end{array} \right\}$$

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$$\left\{ \begin{array}{ccc} 1 & 5 & 8 \\ 0 & 2 & 4 \\ 3 & 3 & -8 \end{array} \right\}$$

```
\[
\left \{
  \begin{tabular}{ccc}
  1 & 5 & 8 \\
  0 & 2 & 4 \\
  3 & 3 & -8
  \end{tabular}
\right \}
\]
```

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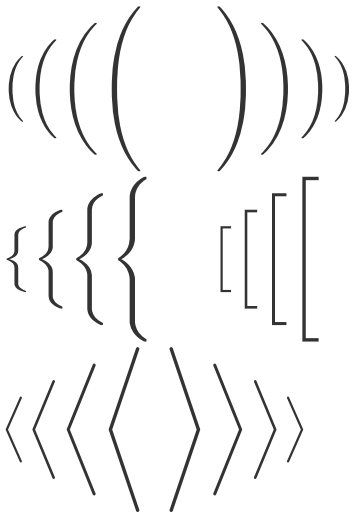

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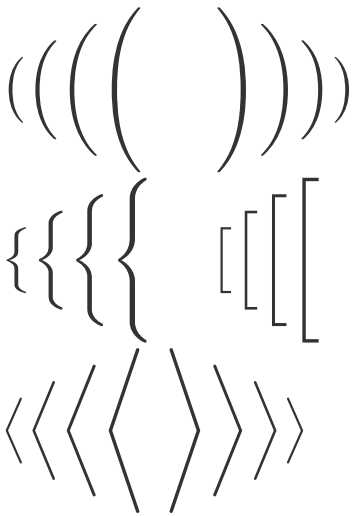

```
$\big( \Big( \bigg( \Bigg($
$\Bigg)\bigg)\Big)\big)$\\
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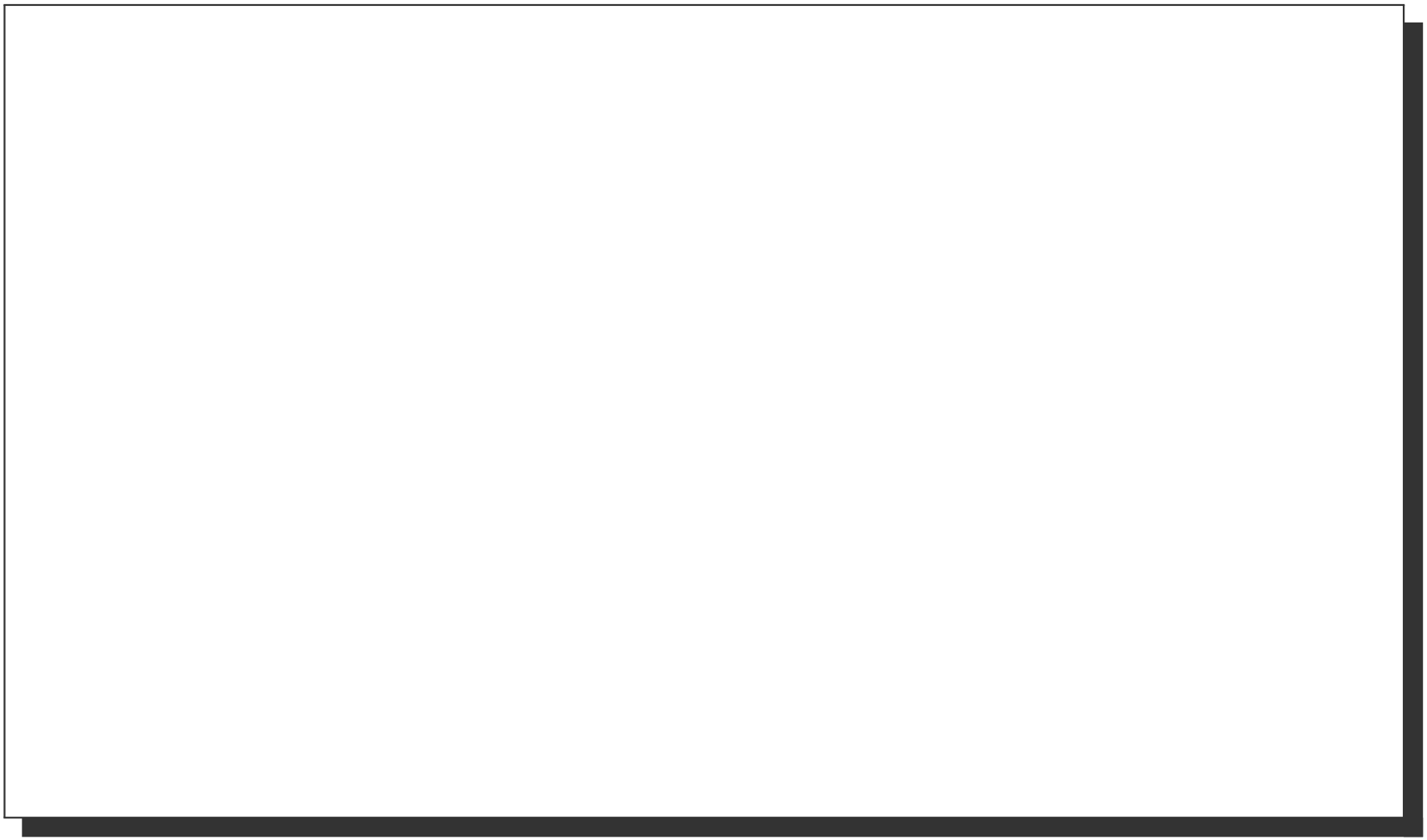
$\big[ \Big[ \bigg[ \Bigg[$\\
$\big \langle \Big \langle \bigg \langle \Bigg \langle$
$\Bigg \rangle\bigg \rangle\Big \rangle \big \rangle
$
```

New Environment

- New environments can be defined in the preamble in following way



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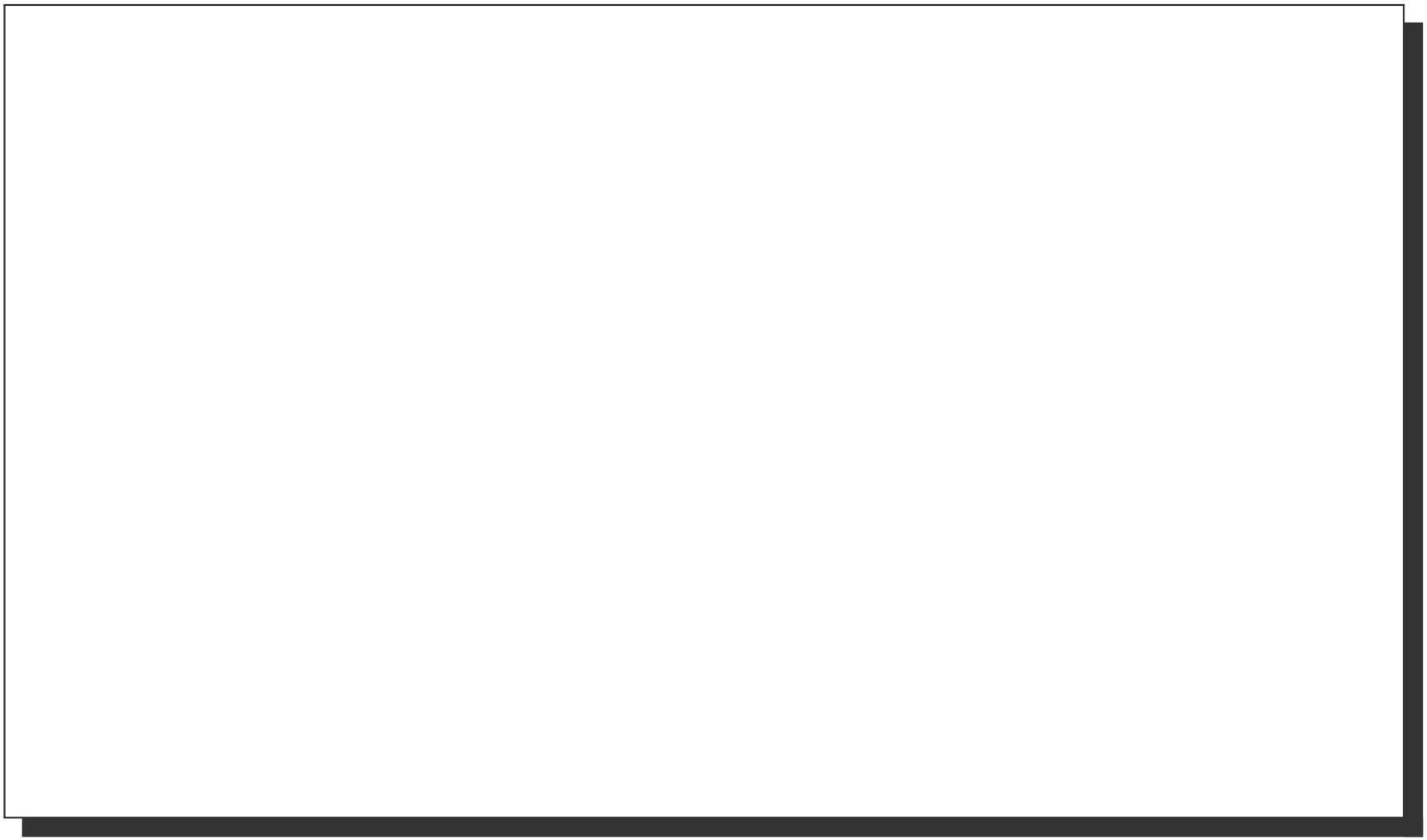

New Environment

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```
\newtheorem{theorem}{Theorem}[section]
\newtheorem{corollary}{Corollary}[theorem]
\newtheorem{lemma}[theorem]{Lemma}
```

The first command wile create new environment `theorem` and it has the additional parameter [section] that restarts the theorem counter at every new section.

New Environment

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The second command wile create new environment `corollary` and the counter of this new environment will be reset every time a new theorem environment is used.

New Environment

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In last case a new environment called lemma is created, it will use the same counter as the theorem environment.

New Environment

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- `\usepackage{amsmath}` provide many predefined environment.

THANK
YOU