LaTeX Syntax Explained Simply

Here is the breakdown of the commands you provided, presented with the **Output** first, followed by the **Code** used to create it.

---

1. Inline Math Modes

Output: $x + y = z$ **Code:**

Code snippet

```
$x + y = z$
```

Output: $\frac{a}{b}$ **Code:**

Code snippet

```
$\frac{a}{b}$
```

Output: (x + y = z) **Code:**

Code snippet

```
\(x + y = z\)
```

Output: (\frac{a}{b}) **Code:**

Code snippet

```
\(\frac{a}{b}\)
```

---

2. Inline Math Styling

Output: $\frac{a}{b}$ (Forces display size) **Code:**

Code snippet

```
$\displaystyle \frac{a}{b}$
```

Output: $\frac{a}{b}$ (Forces inline size) **Code:**

Code snippet

```
$\textstyle \frac{a}{b}$
```

Output: x (Smaller script size) **Code:**

Code snippet

```
$\scriptstyle x$
```

---

3. Fractions

Output: $\frac{a}{b}$ (Standard) **Code:**

Code snippet

```
$\frac{a}{b}$
```

Output: $\frac{a}{b}$ (Text-style/small) **Code:**

Code snippet

```
$\tfrac{a}{b}$
```

Output: $\dfrac{a}{b}$ (Display-style/big) **Code:**

Code snippet

```
$\dfrac{a}{b}$
```

Output: $\cfrac{a}{b}$ (Continued fraction - extra vertical space) **Code:**

Code snippet

```
$\cfrac{a}{b}$
```

---

4. Superscript/Subscript

Output: $x^2 + y_1$ **Code:**

Code snippet

```
$x^2 + y_1$
```

Output: x^{2n} **Code:**

Code snippet

```
$x^{2n}$
```

Output: $x_{i,j}$ **Code:**

Code snippet

```
$x_{i,j}$
```

Output: x_1^2 **Code:**

Code snippet

```
$x_1^2$
```

---

5. Square Root

Output: $\sqrt{x}$, $\sqrt[3]{x}$, $\sqrt[n]{x^m}$ **Code:**

Code snippet

```
$\sqrt{x}$, $\sqrt[3]{x}$, $\sqrt[n]{x^m}$
```

---

6. Display Math Environments

Output:

$$E = mc^2 \tag{1}$$

(Note: The (1) appears automatically in LaTeX) **Code:**

Code snippet

```
\begin{equation}
E = mc^2
\label{eq:einstein}
\end{equation}
```

Output:

$$E = mc^2$$

(No number) **Code:**

Code snippet

```
\begin{equation*}
E = mc^2
\end{equation*}
```

Output:

$$\begin{aligned} x &= 1 \\ y &= 2 \end{aligned} \tag{2}$$

(Numbers both lines) **Code:**

Code snippet

```
\begin{align}
x &= 1 \\
y &= 2
\end{align}
```

Output:

$$\begin{aligned} x &= 1 \\ y &= 2 \end{aligned}$$

(No numbers) **Code:**

Code snippet

```
\begin{align*}
x &= 1 \\
y &= 2
\end{align*}
```

Output:

$$\begin{aligned} x &= 1 + 2 \\ &= 3 \end{aligned} \tag{3}$$

(One number for the whole block) **Code:**

Code snippet

```
\begin{equation}
\begin{split}
x &= 1 + 2 \\
&= 3
\end{split}
\end{equation}
```

Output: *(Centered pile of equations, no alignment)*

$$\begin{gathered} x = 1 \\ y = 2 \end{gathered}$$

Code:

Code snippet

```
\begin{gather}
x = 1 \\
y = 2
\end{gather}
```

---

7. Advanced Math Formatting

Output: $\mathbf{A}, \mathbf{x}$ **Code:**

Code snippet

```
$\mathbf{A}$, $\mathbf{x}$
```

Output: $\boldsymbol{x}$ **Code:**

Code snippet

```
$\boldsymbol{x}$
```

Output: $\mathbb{R}, \mathbb{N}, \mathbb{Z}$ **Code:**

Code snippet

```
$\mathbb{R}$, $\mathbb{N}$, $\mathbb{Z}$
```

Output: $\mathcal{L}, \mathcal{F}$ **Code:**

Code snippet

```
$\mathcal{L}$, $\mathcal{F}$
```

Output: $\mathfrak{G}, \mathfrak{A}$ **Code:**

Code snippet

```
$\mathfrak{G}$, $\mathfrak{A}$
```

Output: $\mathrm{d}x$ **Code:**

Code snippet

```
$\mathrm{d}x$
```

Output: $\text{if } x > 0$ **Code:**

Code snippet

```
$\text{if } x > 0$
```

Output: $\sin(x)$ **Code:**

Code snippet

```
$\operatorname{sin}(x)$
```

Output: xyz **Code:**

Code snippet

```
$\mathit{xyz}$
```

Output: A **Code:**

Code snippet

```
$\mathsf{A}$
```

Output: `code` **Code:**

Code snippet

```
$\mathtt{code}$
```

Output: $x + y$ **Code:**

Code snippet

```
$\textcolor{red}{x} + \textcolor{blue}{y}$
```

---

8. Operators and Relations

Output: $a \pm b, \quad a \mp b, \quad a \times b, \quad a \div b$ **Code:**

Code snippet

```
$a \pm b$, $a \mp b$, $a \times b$, $a \div b$
```

Output: $a \cdot b, \quad a^b, \quad \sqrt[n]{a}$ **Code:**

Code snippet

```
$a \cdot b$, $a^b$, $\sqrt[n]{a}$
```

Output: $a = b, \quad a \neq b, \quad a < b, \quad a > b$ **Code:**

Code snippet

```
$a = b$, $a \neq b$, $a < b$, $a > b$
```

Output: $a = b$, $a \neq b$, $a < b$, $a > b$ **Code:**

Code snippet

```
$a \leq b$, $a \geq b$, $a \equiv b$
```

Output: $a \leq b$, $a \geq b$, $a \equiv b$ **Code:**

Code snippet

```
$a \approx b$, $a \sim b$, $a \propto b$
```

Output: $a \approx b$, $a \sim b$, $a \propto b$ **Code:**

Code snippet

```
$a \approx b$, $a \sim b$, $a \propto b$
```

---

9. Set Notation & Logic

Output: $a \in A$, $a \notin A$, $A \subset B$ **Code:**

Code snippet

```
$a \in A$, $a \notin A$, $A \subset B$
```

Output: $a \in A$, $a \notin A$, $A \subset B$ **Code:**

Code snippet

```
$A \subseteq B$, $A \cap B$, $A \cup B$
```

Output: $A \subseteq B$, $A \cap B$, $A \cup B$ **Code:**

Code snippet

```
$A \subseteq B$, $A \cap B$, $A \cup B$
```

Output: $A \setminus B$, $A \times B$, $\emptyset$ **Code:**

Code snippet

```
$A \setminus B$, $A \times B$, $\emptyset$
```

Output: $A \setminus B$, $A \times B$, $\emptyset$ **Code:**

Code snippet

```
$\forall x$, $\exists x$, $\neg p$, $p \land q$, $p \lor q$
```

Output: $\forall x$, $\exists x$, $\neg p$, $p \land q$, $p \lor q$ **Code:**

Code snippet

```
$\forall x$, $\exists x$, $\neg p$, $p \land q$, $p \lor q$
```

```
$\forall x$, $\exists x$, $\neg p$, $p \land q$, $p \lor q$
```

Output: $\forall x$, $\exists x$, $\neg p$, $p \land q$, $p \lor q$ **Code:**

Code snippet

```
$\Rightarrow$, $\Leftarrow$, $\Leftrightarrow$
```

---

10. Calculus

Output: $\frac{dy}{dx}$, $\partial_x f$, ∇f **Code:**

Code snippet

```
$\frac{dy}{dx}$, $\partial_x f$, $\nabla f$
```

Output: $\int f(x)dx$, $\iint fdA$, $\oint fds$ **Code:**

Code snippet

```
$\int f(x) dx$, $\iint f dA$, $\oint f ds$
```

Output: $\sum_{i=1}^{n}$, $\prod_{i=1}^{n}$ **Code:**

Code snippet

```
$\sum_{i=1}^{n}$, $\prod_{i=1}^{n}$
```

Output: $\lim_{x \to \infty}$ **Code:**

Code snippet

```
$\lim_{x \to \infty}$
```

---

11. Matrix Environments

Output: $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ **Code:**

Code snippet

```
\begin{pmatrix}
a & b \\
c & d
\end{pmatrix}
```

Output: $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ **Code:**

Code snippet

```
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
```

Output: $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ **Code:**

Code snippet

```
\begin{vmatrix}
a & b \\
c & d
\end{vmatrix}
```

Output: $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ **Code:**

Code snippet

```
\begin{Vmatrix}
a & b \\
c & d
\end{Vmatrix}
```

Output: $\begin{Vmatrix} a & b \\ c & d \end{Vmatrix}$ **Code:**

Code snippet

```
\begin{matrix}
a & b \\
c & d
\end{matrix}
```

---

12. Cases, Binomials, and Braces

Output: $f(x) = \begin{cases} 0 & \text{if } x < 0 \\ 1 & \text{if } x \geq 0 \end{cases}$ **Code:**

Code snippet

```
f(x) = \begin{cases}
0 & \text{if } x < 0 \\
1 & \text{if } x \geq 0
\end{cases}
```

Output: $\binom{n}{k}, \quad \dbinom{n}{k}, \quad \tbinom{n}{k}$ **Code:**

Code snippet

```
$\binom{n}{k}$, $\dbinom{n}{k}$, $\tbinom{n}{k}$
```

Output: $\underbrace{a+b}_{2}, \quad \overbrace{a+b}^{2}$ **Code:**

Code snippet

```
$\underbrace{a+b}_{2}$, $\overbrace{a+b}^{2}$
```

---

13. Delimiters (Parentheses Sizing)

Output: $\left(\frac{a}{b}\right), \quad \left[\frac{a}{b}\right], \quad \left\{\frac{a}{b}\right\}$ *(Note: These automatically grow to fit the fraction)* **Code:**

Code snippet

```
\left( \right), \left[ \right], \left\{ \right\}
```

Output: $\left|x\right|, \quad \left\|x\right\|, \quad \left\langle x \right\rangle$ **Code:**

Code snippet

```
\left| \right|, \left\| \right\|, \left\langle \right\rangle
```

Output: $\big(\dots \Big(\dots \bigg(\dots \Bigg(\dots$ *(Manual sizing)* **Code:**

Code snippet

```
\big(, \Big(, \bigg(, \Bigg(
```