

# INTRODUCCIÓN A $\text{\LaTeX}$

CLASE 3: ECUACIONES MATEMÁTICAS

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# CONTENIDO

## Contenidos de la clase:

- ▶ Paquetes
- ▶ Operadores matemáticos
- ▶ Operaciones
- ▶ Subíndices y superíndices
- ▶ Paréntesis, corchetes y llaves
- ▶ Funciones trigonométricas
- ▶ Sumatoria
- ▶ Integrales
- ▶ Límites
- ▶ Marices
- ▶ Alineación de ecuaciones
- ▶ Vectores
- ▶ Acentos
- ▶ Referenciar una ecuación

# PAQUETES

---

```
1 \documentclass{article}
2
3 %Preámbulo
4
5 \usepackage[spanish]{babel}
6 \usepackage[utf8]{inputenc}
7 \usepackage{amssymb, amsmath}
8
```

---

# OPERADORES MATEMÁTICOS

---

```
1 \begin{document}
2 $\pm$, \approx, \geq, \geqslant, \leq, \leqslant, \neq, \ll, \gg, \equiv$
3 \end{document}
```

---

# OPERADORES MATEMÁTICOS

---

```
1 \begin{document}
2 $\pm$, \approx, \geq, \geqslant, \leq, \leqslant, \neq, \ll, \gg, \equiv$
3 \end{document}
```

---

$$\begin{array}{ccc} \pm & \approx & \geq \\ \geq & \leq & \leq \\ \neq & \ll & \gg \\ & \equiv & \end{array}$$

# OPERACIONES

---

```
1 \begin{document}
2 $$\frac{200}{10}=20$$
3 $$\sqrt{9}=3$$
4 $$\sqrt[3]{8}=2$$
5 $$\sqrt[3]{\frac{250}{2}}=\sqrt[3]{125}=5$$
6 \end{document}
```

---

# OPERACIONES

---

```
1 \begin{document}
2 $$\frac{200}{10}=20$$
3 $$\sqrt{9}=3$$
4 $$\sqrt[3]{8}=2$$
5 $$\sqrt[3]{\frac{250}{2}}=\sqrt[3]{125}=5$$
6 \end{document}
```

---

$$\frac{200}{10} = 20$$

$$\sqrt{9} = 3$$

$$\sqrt[3]{8} = 2$$

$$\sqrt[3]{\frac{250}{2}} = \sqrt[3]{125} = 5$$

# SUBÍNDICES Y SUPERÍNDICES

---

```
1 \begin{document}
2 $$E_k=\frac{1}{2}mv^2$$
3 $$a_n=\frac{2^n}{n}\rightarrow a_{n+a}=\frac{2^{n+1}}{n+1}$$
4 \end{document}
```

---



# SUBÍNDICES Y SUPERÍNDICES

---

```
1 \begin{document}
2 $$E_k=\frac{1}{2}mv^2$$
3 $$a_n=\frac{2^n}{n}\Rightarrow a_{n+1}=\frac{2^{n+1}}{n+1}$$
4 \end{document}
```

---

$$E_k = \frac{1}{2}mv^2$$
$$a_n = \frac{2^n}{n} \Rightarrow a_{n+1} = \frac{2^{n+1}}{n+1}$$

# PARÉNTESIS, CORCHETES Y LLAVES

---

```
1 \begin{document}
2 $$\mathbf{x}, \mathbf{y}, \mathbf{z}$$
3 $$[a, \infty[ $$
4 $$\{v_1, v_2, v_3\}$$
5 $$\left(\frac{\frac{7}{8}}{\frac{2}{8}}\right)$$
6 $$\left[\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right]$$
7 $$\left\{\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right\}\right\} \quad \mathbf{$$}
8 \end{document}
```

---

# PARÉNTESIS, CORCHETES Y LLAVES

```
1 \begin{document}
2 $$\mathbf{(x,y,z)}$$
3 $$[a,\infty[
4 $$\{v_1,v_2,v_3\}
5 $$\left(\frac{\frac{7}{8}}{\frac{2}{8}}\right)
6 $$\left[\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right]
7 $$\left\{\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right\}
8 \end{document}
```

$$(x,y,z)$$

$$[a,\infty[$$

$$\{v_1,v_2,v_3\}$$

$$\left(\frac{\frac{7}{8}}{\frac{2}{8}}\right) \quad \left[\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right] \quad \left\{\frac{\frac{x+y}{ab}}{\frac{2a}{b}}\right\}$$

# FUNCIONES TRIGONOMÉTRICAS

---

```
1 \begin{document}
2 $$\sin{\theta}$$
3 $$\cos{\theta}$$
4 $$\tan{\theta}$$
5 \end{document}
```

---

# FUNCIONES TRIGONOMÉTRICAS

---

```
1 \begin{document}
2 $$\sin{\theta}$$
3 $$\cos{\theta}$$
4 $$\tan{\theta}$$
5 \end{document}
```

---

$\sin \theta$	$\cos \theta$	$\tan \theta$
$\arcsin$	$\arccos$	$\arctan$
$\csc$	$\sec$	$\cot$

# SUMATORIA

---

```
1 \begin{document}
2 $$\sum_{n=1}^{10}n$$
3 $$\sum\limits_{i=1}^m\sum\limits_{j=1}^n x_i y_j$$
4 \end{document}
```

---

# SUMATORIA

---

```
1 \begin{document}
2 $$\sum_{n=1}^{10}n$$
3 $$\sum\limits_{i=1}^m\sum\limits_{j=1}^n x_i y_j$$
4 \end{document}
```

---

$$\sum_{n=1}^{10} n$$
$$\sum_{i=1}^m \sum_{j=1}^n x_i y_j$$

# INTEGRALES

---

```
1 \usepackage{pxfonts}
2
3 \begin{document}
4 $$\int_0^5 \mathrm{d}x = x \Big|_0^5$$
5 $$\oint_L = \oiint_A = \oiint_V$$
6 \end{document}
```

---



# INTEGRALES

---

```
1 \usepackage{pxfonts}
2
3 \begin{document}
4 $$\int_0^5 \mathrm{d}x = x \Big|_0^5$$
5 $$\oint_L = \oiint_A = \oiint_V$$
6 \end{document}
```

---

$$\int_0^5 dx = x \Big|_0^5$$
$$\oint_L = \oiint_A = \oiint_V$$

# LÍMITES

---

```
1 \begin{document}
2 $$\lim_{x\rightarrow\infty}\frac{3+x}{x^2}$$
3 \end{document}
```

---

# LÍMITES

---

```
1 \begin{document}
2 $$\lim_{x\rightarrow\infty}\frac{3+x}{x^2}$$
3 \end{document}
```

---

$$\lim_{x \rightarrow \infty} \frac{3+x}{x^2}$$

# MATRICES

---

```
1 \begin{document}
2 $$\begin{matrix}
3 5 & 4 & 8 \\
4 4 & 0 & 7 \\
5 3 & 5 & 6
6 \end{matrix}$$
7 % pmatrix, bmatrix, Bmatrix, vmatrix y Vmatrix
8 \end{document}
```

---

# MATRICES

---

```
1 \begin{document}
2 $$\begin{matrix}
3 5 & 4 & 8 \\
4 4 & 0 & 7 \\
5 3 & 5 & 6
6 \end{matrix}$$
7 % pmatrix, bmatrix, Bmatrix, vmatrix y Vmatrix
8 \end{document}
```

---

$$\begin{matrix} 5 & 4 & 8 \\ 4 & 0 & 7 \\ 3 & 5 & 6 \end{matrix} \quad \begin{bmatrix} 5 & 4 & 8 \\ 4 & 0 & 7 \\ 3 & 5 & 6 \end{bmatrix} \quad \begin{pmatrix} 5 & 4 & 8 \\ 4 & 0 & 7 \\ 3 & 5 & 6 \end{pmatrix} \quad \begin{vmatrix} 5 & 4 & 8 \\ 4 & 0 & 7 \\ 3 & 5 & 6 \end{vmatrix} \quad \left\| \begin{matrix} 5 & 4 & 8 \\ 4 & 0 & 7 \\ 3 & 5 & 6 \end{matrix} \right\|$$

# ALINEACIÓN DE ECUACIONES

## ► Entorno *multiline*

---

```
1 \begin{document}
2 \begin{multiline}
3 (x+y+z)^3+(k+j)^2+m^2+n=x^3+y^3+z^3 \\
4 +3x^2y+3x^2z+3xy^2+3y^2z+3xz^2+3yz^2+6xyz+k^2+2kj+j^2+m^2+n
5 \end{multiline}
6 \end{document}
```

---

# ALINEACIÓN DE ECUACIONES

## ► Entorno *multiline*

---

```
1 \begin{document}
2 \begin{multline}
3 (x+y+z)^3+(k+j)^2+m^2+n=x^3+y^3+z^3 \\
4 +3x^2y+3x^2z+3xy^2+3y^2z+3xz^2+3yz^2+6xyz+k^2+2kj+j^2+m^2+n
5 \end{multline}
6 \end{document}
```

---

$$(x + y + z)^3 + (k + j)^2 + m^2 + n = x^3 + y^3 + z^3 \\ + 3x^2y + 3x^2z + 3xy^2 + 3y^2z + 3xz^2 + 3yz^2 + 6xyz + k^2 + 2kj + j^2 + m^2 + n \quad (1)$$

# ALINEACIÓN DE ECUACIONES

► Entorno *equation-split*

---

```
1 \begin{document}
2 \begin{equation}
3 \begin{split}
4 (a+b)^2& = (a+b)(a+b)\\
5 & = a^2 + ab + ab + b^2\\
6 & = a^2 + 2ab + b^2
7 \end{split}
8 \end{equation}
9 \end{document}
```

---



# ALINEACIÓN DE ECUACIONES

## ► Entorno *equation-split*

---

```
1 \begin{document}
2 \begin{equation}
3 \begin{split}
4 (a+b)^2&= (a+b)(a+b)\\
5 &= a^2 + ab + ab + b^2\\
6 &= a^2 + 2ab + b^2
7 \end{split}
8 \end{equation}
9 \end{document}
```

---

$$\begin{aligned}(a+b)^2 &= (a+b)(a+b) \\ &= a^2 + ab + ab + b^2 \\ &= a^2 + 2ab + b^2\end{aligned}\tag{2}$$

# ALINEACIÓN DE ECUACIONES

## ► Entorno *align*

---

```
1 \begin{document}
2 \begin{align}
3 ((a+b)^2&= a^2 + 2ab + b^2\\
4 (a-b)^2&= a^2 - 2ab + b^2\\
5 (a+b)(a-b)&= a^2 - b^2
6 \end{align}
7 \end{document}
```

---

# ALINEACIÓN DE ECUACIONES

## ► Entorno *align*

---

```
1 \begin{document}
2 \begin{align}
3 ((a+b)^2&= a^2 + 2ab + b^2\\
4 (a-b)^2&= a^2 - 2ab + b^2\\
5 (a+b)(a-b)&= a^2 - b^2
6 \end{align}
7 \end{document}
```

---

$$((a + b)^2 = a^2 + 2ab + b^2 \tag{3}$$

$$(a - b)^2 = a^2 - 2ab + b^2 \tag{4}$$

$$(a + b)(a - b) = a^2 - b^2 \tag{5}$$

# ALINEACIÓN DE ECUACIONES

## ► Entorno *gather*

---

```
1 \begin{document}
2 \begin{gather}
3 ((a+b)^2 = a^2 + 2ab + b^2\\
4 (a-b)^2 = a^2 - 2ab + b^2\\
5 (a+b)(a-b) = a^2 - b^2
6 \end{gather}
7 \end{document}
```

---

# ALINEACIÓN DE ECUACIONES

## ► Entorno *gather*

---

```
1 \begin{document}
2 \begin{gather}
3 ((a+b)^2 = a^2 + 2ab + b^2\\
4 (a-b)^2 = a^2 - 2ab + b^2\\
5 (a+b)(a-b) = a^2 - b^2
6 \end{gather}
7 \end{document}
```

---

$$((a + b)^2 = a^2 + 2ab + b^2 \tag{6}$$

$$(a - b)^2 = a^2 - 2ab + b^2 \tag{7}$$

$$(a + b)(a - b) = a^2 - b^2 \tag{8}$$

# VECTORES

---

```
1 \begin{document}
2 $$\vec{r}\Leftrightarrow\boldsymbol{r}$$
3 $$\hat{i},\hat{j},\hat{k}$$
4 \end{document}
```

---

# VECTORES

---

```
1 \begin{document}
2 $$\vec{r}\Leftrightarrow\boldsymbol{r}$$
3 $$\hat{i},\hat{j},\hat{k}$$
4 \end{document}
```

---

$$\vec{r} \longleftrightarrow \boldsymbol{r}$$

$$\hat{i} \quad \hat{j} \quad \hat{k}$$

# ACENTOS

---

```
1 \begin{document}
2 $$\bar{a}, \hat{a}, \vec{a}, \dot{a}, \ddot{a}, \dddot{a}$$
3 \end{document}
```

---



# ACENTOS

```
1 \begin{document}  
2 $$\bar{a}, \hat{a}, \vec{a}, \dot{a}, \ddot{a}, \text{\texttt{\char"0041}}$$  
3 \end{document}
```

$\bar{a}$     $\hat{a}$     $\vec{a}$     $\dot{a}$     $\ddot{a}$     $\text{\texttt{\char"0041}}$

# REFERENCIAR UNA ECUACIÓN

---

```
1 \begin{document}
2 \begin{equation}\label{eq9}
3     F'(\textbf{r})=\frac{F(\textbf{r})}{\det \textbf{J}}.
4 \end{equation}
5 [...] \\
6 Mediante \ref{eq9} podemos destacar varias cosas: [...]
7 \end{document}
```

---

# REFERENCIAR UNA ECUACIÓN

---

```
1 \begin{document}
2 \begin{equation}\label{eq9}
3     F'(\textbf{r})=\frac{\textbf{J}F(\textbf{r})}{\det \textbf{J}}.
4 \end{equation}
5 [...] \\
6 Mediante \ref{eq9} podemos destacar varias cosas: [...]
7 \end{document}
```

---

$$F'(\vec{r}) = \frac{\mathbf{J}F(\vec{r})\mathbf{J}^T}{\det \mathbf{J}}. \quad (9)$$

[...]

Mediante 9 podemos destacar varias cosas: [...]

# MÁS INFORMACIÓN

## Links externos

- ▶ Editor de ecuaciones
- ▶ Editor de ecuaciones<sup>+</sup>

# TRABAJO PRÁCTICO

## Realizar la siguiente actividad:

Generar las siguientes ecuaciones matemáticas:

$$\frac{1}{4}W_{\mu\nu} \cdot W^{\mu\nu} - \frac{1}{4}B_{\mu\nu}B^{\mu\nu} - \frac{1}{4}G_{\mu\nu}^a G_a^{\mu\nu}$$

$$\int_b^a f'(x)dx = f(b) - f(a)$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \quad , \quad \nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

$$e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

$$y = \frac{\sum_i w_i y_i}{\sum_i w_i}$$