WPG

Practical LaTeX # 22

Align Environment

Outline

WPG

- **Aligned Formulas**
  - **Simple Alignment**
  - **Annotated Alignment**
  - **Cases**
- **Align Environment**
- **Integral Annotated Alignment Example**

Simple Alignment

WPG

- **Simple Alignment** is used to **align two ore more formulas**.

$$x_1 - 2x_2 - x_3 + 3x_4 = 0 \quad (1)$$
$$-2x_1 + 4x_2 + 5x_3 - 5x_4 = 3 \quad (2)$$
$$3x_1 - 6x_2 - 6x_3 + 8x_4 = 2 \quad (3)$$

```
\begin{align}

\end{align}
```

Align Environment

WPG

- Align environment **aligns the equations** with respect to the **&** symbol.
- **Multiple equations** are separated by the **\\ line break** command.
- It automatically **numbers each equation**.
- **To unnumbered the equation** use the **\notag** command after the equation.
- **Equation numbers can be removed** by the **align*** environment.
- **Labels can be added** to each equation by the **\label** command.

Align Environment

WPG

$$x_1 - 2x_2 - x_3 + 3x_4 = 0 \quad (1)$$
$$-2x_1 + 4x_2 + 5x_3 - 5x_4 = 3 \quad (2)$$
$$3x_1 - 6x_2 - 6x_3 + 8x_4 = 2 \quad (3)$$

```
\begin{align}
    x_1 - 2x_2 - x_3 + 3x_4 &= 0 \\
    -2x_1 + 4x_2 + 5x_3 - 5x_4 &= 3 \\
    3x_1 - 6x_2 -6x_3 + 8x_4 &= 2
\end{align}
```

Align Environment

WPG

$$
\begin{aligned}
x_1 - 2x_2 - x_3 + 3x_4 &= 0 \\
-2x_1 + 4x_2 + 5x_3 - 5x_4 &= 3 \\
3x_1 - 6x_2 - 6x_3 + 8x_4 &= 2
\end{aligned} \tag{4}
$$

```
\begin{align}
    x_1 - 2x_2 - x_3 + 3x_4 &= 0 \\
    -2x_1 + 4x_2 + 5x_3 - 5x_4 &= 3 \notag\\
    3x_1 - 6x_2 -6x_3 + 8x_4 &= 2 \notag
\end{align}
```

Align Environment

WPG

$$
\begin{aligned}
x_1 - 2x_2 - x_3 + 3x_4 &= 0 \\
-2x_1 + 4x_2 + 5x_3 - 5x_4 &= 3 \\
3x_1 - 6x_2 - 6x_3 + 8x_4 &= 2
\end{aligned}
$$

```
\begin{align*}
    x_1 - 2x_2 - x_3 + 3x_4 &= 0 \\
    -2x_1 + 4x_2 + 5x_3 - 5x_4 &= 3 \\
    3x_1 - 6x_2 -6x_3 + 8x_4 &= 2
\end{align*}
```

Annotated Alignment

WPG

- In annotated alignment, **formulas and their explanatory text** can be **aligned**.
- Equation and the **explanatory text** is **separated** by the **&&**

Annotated Alignment

WPG

$$\begin{aligned}
\lim_{x\to c}(x^3 + 4x^2 - 3) &= \lim_{x\to c}x^3 + \lim_{x\to c}4x^2 - \lim_{x\to c} 3 && \text{Sum and Difference Rules}\\
&= c^3 + 4c^2 - 2 && \text{Power and Multiple Rules}
\end{aligned}$$

```
\begin{align*}
    \lim_{x\to c}(x^3 + 4x^2 - 3) &= \lim_{x\to c}x^3 + \lim_{x\to c}4x^2 -
    \lim_{x\to c} 3  && \text{Sum and Difference Rules}\\
        &= c^3 + 4c^2 - 2 && \text{Power and Multiple Rules}
\end{align*}
```

Annotated Alignment

WPG

Explanatory **text width** can be controlled by the **\parbox{width}{text}** command.

$$\begin{aligned} \lim_{x\to c}(x^3 + 4x^2 - 3) &= \lim_{x\to c}x^3 + \lim_{x\to c}4x^2 - \lim_{x\to c} 3 && \text{Sum and Difference Rules}\\ &= c^3 + 4c^2 - 2 && \text{Power and Multiple Rules} \end{aligned}$$

```
\begin{align*}
    \lim_{x\to c}(x^3 + 4x^2 - 3) &= \lim_{x\to c}x^3 + \lim_{x\to c}4x^2 -
    \lim_{x\to c} 3  && \text{Sum and Difference Rules}\\
    &= c^3 + 4c^2 - 2 && \text{\parbox{3cm}{Power and Multiple Rules}}
\end{align*}
```

Annotated Alignment | Integral Example

WPG

$$
\begin{aligned}
\int_0^{\pi/4} \frac{\mathrm{d}x}{1-\sin x} &= \int_0^{\pi/4} \frac{1}{1-\sin x} \cdot \frac{1+\sin x}{1+sinx}\,\mathrm{d}x && \text{Multiply and divide by conjugate.}\\
&= \int_0^{\pi/4} \frac{1+\sin x}{1-\sin^2 x}\,\mathrm{d}x && \text{Simplify.}\\
&= \int_0^{\pi/4} \frac{1+\sin x}{\cos^2 x}\,\mathrm{d}x && 1-\sin^2 x = \cos^2 x\\
&= \int_0^{\pi/4} (\sec^2 x + \sec^2 x \tan x)\,\mathrm{d}x && \text{Use Table 8.1, Formulas 8 and 10}\\
&= [\tan x + \sec x]_0^{\pi/4}\\
&= (1+\sqrt{2}-(0+1))\\
&= \sqrt{2}.
\end{aligned}
$$

Annotated Alignment | Integral Example

WPG

```
\begin{align*}
    \int_{0}^{\pi/4} \frac{\dif x}{1-\sin{x}} &= \int_{0}^{\pi/4} \frac{1}{1-\sin{x}} \cdot \frac{1 +
    \sin{x}}{1 + sin{x}} \dif x && \text{\parbox{3cm}{Multiply and divide by conjugate.}} \\
        &= \int_{0}^{\pi/4} \frac{1 + \sin{x}}{1- \sin^2{x}} \dif x && \text{Simplify.}\\
        &= \int_{0}^{\pi/4} \frac{1 + \sin{x}}{\cos^2{x}} \dif x && 1 - \sin^2{x} = \cos^2{x} \\
        &= \int_{0}^{\pi/4} (\sec^2{x} + \sec^2{x} \tan{x}) \dif x && \text{\parbox{2.8cm}{Use Table
        8.1, Formulas 8 and 10}}\\
        &= \left[ \tan{x} + \sec{x} \right]_{0}^{\pi/4} \\
        &= ( 1 + \sqrt{2} - (0 + 1)) \\
        &= \sqrt{2}.
\end{align*}
```

WP Galaxy

WPG

Follow on

twitter.com/017FastAbuzar

www.linkedin.com/in/abuzarghafari

https://github.com/AbuzarGhafari

Join Facebook WPG Latex Learning Group

https://www.facebook.com/groups/744709572836598

Like, Comment, Share and Subscribe the Channel

WP Galaxy

WPG