

$$\begin{aligned}
\begin{vmatrix} 1 & 3 & 0 & 5 \\ -2 & 0 & 4 & 0 \\ 1 & 2 & -1 & 3 \\ 1 & -2 & 1 & -1 \end{vmatrix} &= -(-2) \begin{vmatrix} 3 & 0 & 5 \\ 2 & -1 & 3 \\ -2 & 1 & -1 \end{vmatrix} - 4 \begin{vmatrix} 1 & 3 & 5 \\ 1 & 2 & 3 \\ 1 & -2 & -1 \end{vmatrix} \\
&= 2 \left( 3 \begin{vmatrix} -1 & 3 \\ 1 & -1 \end{vmatrix} + 5 \begin{vmatrix} 2 & -1 \\ -2 & 1 \end{vmatrix} \right) \\
&\quad - 4 \left( 1 \begin{vmatrix} 2 & 3 \\ -2 & -1 \end{vmatrix} - 3 \begin{vmatrix} 1 & 3 \\ 1 & -1 \end{vmatrix} + 5 \begin{vmatrix} 1 & 2 \\ 1 & -2 \end{vmatrix} \right) \\
&= 2(3 \times (-2) + 5 \times 0) - 4(1 \times 4 - 3 \times (-4) + 5 \times (-4)) \\
&= 2(-6) - 4(4 + 12 - 20) \\
&= -12 + 16 \\
&= 4 \\
&\neq 0 \\
&\implies \text{Vectors are linearly independent}
\end{aligned}$$

Instead of

$$\begin{vmatrix} 1 & 3 & 0 & 5 \\ -2 & 0 & 4 & 0 \\ 1 & 2 & -1 & 3 \\ 1 & -2 & 1 & -1 \end{vmatrix}$$

you can also write

$$\begin{vmatrix} 1 & 3 & 0 & 5 \\ -2 & 0 & 4 & 0 \\ 1 & 2 & -1 & 3 \\ 1 & -2 & 1 & -1 \end{vmatrix}$$

or

$$\begin{vmatrix} 1 & 3 & 0 & 5 \\ -2 & 0 & 4 & 0 \\ 1 & 2 & -1 & 3 \\ 1 & -2 & 1 & -1 \end{vmatrix}$$

The `vmatrix*` environment is defined in the `mathtools` package, which should then be loaded instead of `amsmath`.