

⑦

1- ad Produkt abbild

$$\text{ad} g_1(g_2) = (a_2, b_2, c_2, d_2) \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & -g_1 & d_1 & 0 \\ 0 & d_1 & 0 & -d_1 \\ 0 & 0 & -b_1 & c_1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$(g_1 g_2) = (a_1 a_2, a_1 b_2 + b_1 a_2, a_1 c_2 + b_1 c_1 + c_1 a_2, a_1 d_2 + b_1 d_1 + c_1 d_1 + d_1 a_2)$   
 $(g_1 g_2) = (a_1 a_2, a_1 b_2 + b_1 a_2, a_1 c_2 + b_1 c_1 + c_1 a_2, a_1 d_2 + b_1 d_1 + c_1 d_1 + d_1 a_2)$   
 $(g_1 g_2) = (a_1 a_2, a_1 b_2 + b_1 a_2, a_1 c_2 + b_1 c_1 + c_1 a_2, a_1 d_2 + b_1 d_1 + c_1 d_1 + d_1 a_2)$   
 $(g_1 g_2) = (a_1 a_2, a_1 b_2 + b_1 a_2, a_1 c_2 + b_1 c_1 + c_1 a_2, a_1 d_2 + b_1 d_1 + c_1 d_1 + d_1 a_2)$

$$(g_1 g_2) = (a_1 a_2, a_1 b_2 + b_1 a_2, a_1 c_2 + b_1 c_1 + c_1 a_2, a_1 d_2 + b_1 d_1 + c_1 d_1 + d_1 a_2)$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$