

$$\begin{pmatrix} \cos[\phi] & -\sin[\phi] & 0 \\ \sin[\phi] & \cos[\phi] & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} \cos[\theta] & 0 & \sin[\theta] \\ 0 & 1 & 0 \\ -\sin[\theta] & 0 & \cos[\theta] \end{pmatrix} \cdot \begin{pmatrix} \cos[\psi] & -\sin[\psi] & 0 \\ \sin[\psi] & \cos[\psi] & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\begin{aligned} &\{ \cos[\theta] \cos[\phi] \cos[\psi] - \sin[\phi] \sin[\psi], \\ &\quad -\cos[\psi] \sin[\phi] - \cos[\theta] \cos[\phi] \sin[\psi], \cos[\phi] \sin[\theta] \}, \\ &\{ \cos[\theta] \cos[\psi] \sin[\phi] + \cos[\phi] \sin[\psi], \cos[\phi] \cos[\psi] - \cos[\theta] \sin[\phi] \sin[\psi], \sin[\theta] \sin[\phi] \}, \\ &\{ -\cos[\psi] \sin[\theta], \sin[\theta] \sin[\psi], \cos[\theta] \} \} \end{aligned}$$

$$\text{Det} \left[\begin{pmatrix} \cos[\phi] & -\sin[\phi] & 0 \\ \sin[\phi] & \cos[\phi] & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} \cos[\theta] & 0 & \sin[\theta] \\ 0 & 1 & 0 \\ -\sin[\theta] & 0 & \cos[\theta] \end{pmatrix} \cdot \begin{pmatrix} \cos[\psi] & -\sin[\psi] & 0 \\ \sin[\psi] & \cos[\psi] & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

$$\begin{aligned} &\cos[\theta]^2 \cos[\phi]^2 \cos[\psi]^2 + \cos[\phi]^2 \cos[\psi]^2 \sin[\theta]^2 + \\ &\cos[\theta]^2 \cos[\psi]^2 \sin[\phi]^2 + \cos[\psi]^2 \sin[\theta]^2 \sin[\phi]^2 + \cos[\theta]^2 \cos[\phi]^2 \sin[\psi]^2 + \\ &\cos[\phi]^2 \sin[\theta]^2 \sin[\psi]^2 + \cos[\theta]^2 \sin[\phi]^2 \sin[\psi]^2 + \sin[\theta]^2 \sin[\phi]^2 \sin[\psi]^2 \end{aligned}$$

$$\begin{aligned} &\text{Simplify}[\cos[\theta]^2 \cos[\phi]^2 \cos[\psi]^2 + \cos[\phi]^2 \cos[\psi]^2 \sin[\theta]^2 + \\ &\quad \cos[\theta]^2 \cos[\psi]^2 \sin[\phi]^2 + \cos[\psi]^2 \sin[\theta]^2 \sin[\phi]^2 + \cos[\theta]^2 \cos[\phi]^2 \sin[\psi]^2 + \\ &\quad \cos[\phi]^2 \sin[\theta]^2 \sin[\psi]^2 + \cos[\theta]^2 \sin[\phi]^2 \sin[\psi]^2 + \sin[\theta]^2 \sin[\phi]^2 \sin[\psi]^2] \end{aligned}$$

1

$$\begin{aligned} &\text{Simplify}[\text{Dot}[\{\cos[\theta] \cos[\phi] \cos[\psi] - \sin[\phi] \sin[\psi], -\cos[\psi] \sin[\phi] - \cos[\theta] \cos[\phi] \sin[\psi], \\ &\quad \cos[\phi] \sin[\theta]\}, \{\cos[\theta] \cos[\phi] \cos[\psi] - \sin[\phi] \sin[\psi], \\ &\quad -\cos[\psi] \sin[\phi] - \cos[\theta] \cos[\phi] \sin[\psi], \cos[\phi] \sin[\theta]\}]] \end{aligned}$$

1

$$\begin{aligned} &\text{Simplify}[\text{Dot}[\{\cos[\theta] \cos[\phi] \cos[\psi] - \sin[\phi] \sin[\psi], -\cos[\psi] \sin[\phi] - \cos[\theta] \cos[\phi] \sin[\psi], \\ &\quad \cos[\phi] \sin[\theta]\}, \{\cos[\theta] \cos[\psi] \sin[\phi] + \cos[\phi] \sin[\psi], \\ &\quad \cos[\phi] \cos[\psi] - \cos[\theta] \sin[\phi] \sin[\psi], \sin[\theta] \sin[\phi]\}]] \end{aligned}$$

0

$$\text{Det} \left[\begin{pmatrix} -0.0548755 & -0.873437 & -0.483835 \\ 0.49411 & -0.44483 & 0.746982 \\ -0.867666 & -0.198076 & 0.455984 \end{pmatrix} \right]$$

1.