In[14]:=
$$\begin{pmatrix} \text{Cos}[\phi] & -\text{Sin}[\phi] & 0 \\ \text{Sin}[\phi] & \text{Cos}[\phi] & 0 \\ 0 & 0 & 1 \end{pmatrix} . \begin{pmatrix} \text{Cos}[\theta] & 0 & \text{Sin}[\theta] \\ 0 & 1 & 0 \\ -\text{Sin}[\theta] & 0 & \text{Cos}[\theta] \end{pmatrix} . \begin{pmatrix} \text{Cos}[\psi] & -\text{Sin}[\psi] & 0 \\ \text{Sin}[\psi] & \text{Cos}[\psi] & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

Out[14]=
$$\{\{\text{Cos}[\theta]\,\text{Cos}[\phi]\,\text{Cos}[\psi] - \text{Sin}[\phi]\,\text{Sin}[\psi],\ -\text{Cos}[\psi]\,\text{Sin}[\phi] - \text{Cos}[\theta]\,\text{Cos}[\phi]\,\text{Sin}[\psi],\ \text{Cos}[\phi]\,\text{Sin}[\theta]\},\ \{\text{Cos}[\theta]\,\text{Cos}[\psi]\,\text{Sin}[\phi] + \text{Cos}[\phi]\,\text{Sin}[\psi],\ \text{Cos}[\phi]\,\text{Cos}[\psi] - \text{Cos}[\theta]\,\text{Sin}[\phi]\,\text{Sin}[\psi],\ \text{Sin}[\theta]\,\text{Sin}[\phi]\},\ \{-\text{Cos}[\psi]\,\text{Sin}[\theta],\ \text{Sin}[\theta]\,\text{Sin}[\psi],\ \text{Cos}[\theta]\}\}$$

In[23]:=
$$\text{Det}\left[\begin{pmatrix} \text{Cos}[\phi] & -\text{Sin}[\phi] & 0 \\ \text{Sin}[\phi] & \text{Cos}[\phi] & 0 \\ 0 & 0 & 1 \end{pmatrix} . \begin{pmatrix} \text{Cos}[\theta] & 0 & \text{Sin}[\theta] \\ 0 & 1 & 0 \\ -\text{Sin}[\theta] & 0 & \text{Cos}[\theta] \end{pmatrix} . \begin{pmatrix} \text{Cos}[\psi] & -\text{Sin}[\psi] & 0 \\ \text{Sin}[\psi] & \text{Cos}[\psi] & 0 \\ 0 & 0 & 1 \end{pmatrix}\right]$$

Out[23]=
$$\text{Cos}[\theta]^2\,\text{Cos}[\phi]^2\,\text{Cos}[\psi]^2 + \text{Cos}[\phi]^2\,\text{Cos}[\psi]^2\,\text{Sin}[\theta]^2 + \text{Cos}[\theta]^2\,\text{Cos}[\psi]^2\,\text{Sin}[\phi]^2 + \text{Cos}[\psi]^2\,\text{Sin}[\theta]^2\,\text{Sin}[\phi]^2 + \text{Cos}[\theta]^2\,\text{Cos}[\phi]^2\,\text{Sin}[\psi]^2 + \text{Cos}[\phi]^2\,\text{Sin}[\theta]^2\,\text{Sin}[\psi]^2 + \text{Cos}[\theta]^2\,\text{Sin}[\phi]^2\,\text{Sin}[\psi]^2 + \text{Sin}[\theta]^2\,\text{Sin}[\phi]^2\,\text{Sin}[\psi]^2$$

In[24]:=
```
Simplify[Cos[θ]^2 Cos[ϕ]^2 Cos[ψ]^2 + Cos[ϕ]^2 Cos[ψ]^2 Sin[θ]^2 +
  Cos[θ]^2 Cos[ψ]^2 Sin[ϕ]^2 + Cos[ψ]^2 Sin[θ]^2 Sin[ϕ]^2 + Cos[θ]^2 Cos[ϕ]^2 Sin[ψ]^2 +
  Cos[ϕ]^2 Sin[θ]^2 Sin[ψ]^2 + Cos[θ]^2 Sin[ϕ]^2 Sin[ψ]^2 + Sin[θ]^2 Sin[ϕ]^2 Sin[ψ]^2]
```

Out[24]= 1

In[26]:=
```
Simplify[
 Dot[{Cos[θ] Cos[ϕ] Cos[ψ] - Sin[ϕ] Sin[ψ], -Cos[ψ] Sin[ϕ] - Cos[θ] Cos[ϕ] Sin[ψ],
   Cos[ϕ] Sin[θ]}, {Cos[θ] Cos[ϕ] Cos[ψ] - Sin[ϕ] Sin[ψ],
   -Cos[ψ] Sin[ϕ] - Cos[θ] Cos[ϕ] Sin[ψ], Cos[ϕ] Sin[θ]}]]
```

Out[26]= 1

In[27]:=
```
Simplify[
 Dot[{Cos[θ] Cos[ϕ] Cos[ψ] - Sin[ϕ] Sin[ψ], -Cos[ψ] Sin[ϕ] - Cos[θ] Cos[ϕ] Sin[ψ],
   Cos[ϕ] Sin[θ]}, {Cos[θ] Cos[ψ] Sin[ϕ] + Cos[ϕ] Sin[ψ],
   Cos[ϕ] Cos[ψ] - Cos[θ] Sin[ϕ] Sin[ψ], Sin[θ] Sin[ϕ]}]]
```

Out[27]= 0