Python version $= 3 \cdot 6 \cdot 2 | Anaconda, Inc \cdot | (default, Sep 19 2017, 08:03:39) [MSC v \cdot 1900 64 bit (AMD64)]$

$$\boldsymbol{a} = a^t \boldsymbol{e}_t + a^x \boldsymbol{e}_x + a^y \boldsymbol{e}_y + a^z \boldsymbol{e}_z$$

$$\begin{aligned}\boldsymbol{M} =& M \\ &+ M^t \boldsymbol{e}_t + M^x \boldsymbol{e}_x + M^y \boldsymbol{e}_y + M^z \boldsymbol{e}_z \\ &+ M^{tx} \boldsymbol{e}_t \wedge \boldsymbol{e}_x + M^{ty} \boldsymbol{e}_t \wedge \boldsymbol{e}_y + M^{tz} \boldsymbol{e}_t \wedge \boldsymbol{e}_z + M^{xy} \boldsymbol{e}_x \wedge \boldsymbol{e}_y + M^{xz} \boldsymbol{e}_x \wedge \boldsymbol{e}_z + M^{yz} \boldsymbol{e}_y \wedge \boldsymbol{e}_z \\ &+ M^{txy} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_y + M^{txz} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_z + M^{tyz} \boldsymbol{e}_t \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z + M^{xyz} \boldsymbol{e}_x \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z \\ &+ M^{txyz} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z\end{aligned}$$

$$\boldsymbol{a}\boldsymbol{a} = {a^t}^2 - {a^x}^2 - {a^y}^2 - {a^z}^2$$

$$\begin{aligned}\boldsymbol{a}^{-1} =& \frac{a^t}{{a^t}^2 - {a^x}^2 - {a^y}^2 - {a^z}^2} \boldsymbol{e}_t \\ &+ \frac{a^x}{{a^t}^2 - {a^x}^2 - {a^y}^2 - {a^z}^2} \boldsymbol{e}_x \\ &+ \frac{a^y}{{a^t}^2 - {a^x}^2 - {a^y}^2 - {a^z}^2} \boldsymbol{e}_y \\ &+ \frac{a^z}{{a^t}^2 - {a^x}^2 - {a^y}^2 - {a^z}^2} \boldsymbol{e}_z\end{aligned}$$

$$\langle \boldsymbol{M} \rangle_1 \langle \boldsymbol{M} \rangle_1 = {M^t}^2 - {M^x}^2 - {M^y}^2 - {M^z}^2$$

$$\begin{aligned}\langle \boldsymbol{M} \rangle_1^{-1} =& \frac{M^t}{{M^t}^2 - {M^x}^2 - {M^y}^2 - {M^z}^2} \boldsymbol{e}_t \\ &+ \frac{M^x}{{M^t}^2 - {M^x}^2 - {M^y}^2 - {M^z}^2} \boldsymbol{e}_x \\ &+ \frac{M^y}{{M^t}^2 - {M^x}^2 - {M^y}^2 - {M^z}^2} \boldsymbol{e}_y \\ &+ \frac{M^z}{{M^t}^2 - {M^x}^2 - {M^y}^2 - {M^z}^2} \boldsymbol{e}_z\end{aligned}$$

$$\langle \boldsymbol{M} \rangle_3 = M^{txy} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_y + M^{txz} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_z + M^{tyz} \boldsymbol{e}_t \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z + M^{xyz} \boldsymbol{e}_x \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z$$

$$\langle \boldsymbol{M} \rangle_3 \langle \boldsymbol{M} \rangle_3 = -{M^{txy}}^2 - {M^{txz}}^2 - {M^{tyz}}^2 + {M^{xyz}}^2$$

$$\begin{aligned}\langle \boldsymbol{M} \rangle_3^{-1} =& -\frac{M^{txy}}{{M^{txy}}^2 + {M^{txz}}^2 + {M^{tyz}}^2 - {M^{xyz}}^2} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_y \\ &- \frac{M^{txz}}{{M^{txy}}^2 + {M^{txz}}^2 + {M^{tyz}}^2 - {M^{xyz}}^2} \boldsymbol{e}_t \wedge \boldsymbol{e}_x \wedge \boldsymbol{e}_z \\ &- \frac{M^{tyz}}{{M^{txy}}^2 + {M^{txz}}^2 + {M^{tyz}}^2 - {M^{xyz}}^2} \boldsymbol{e}_t \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z \\ &- \frac{M^{xyz}}{{M^{txy}}^2 + {M^{txz}}^2 + {M^{tyz}}^2 - {M^{xyz}}^2} \boldsymbol{e}_x \wedge \boldsymbol{e}_y \wedge \boldsymbol{e}_z\end{aligned}$$