

Python

Python version = 3.4.3|Anaconda2.3.0(32-bit)|(default, Mar62015, 12 : 08 : 17)[MSCv.160032bit(Intel)]

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

$$\mathbf{M} = M$$

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

$$\mathbf{a}\mathbf{a} = a^{t2} - a^{x2} - a^{y2} - a^{z2}$$

$$\begin{aligned} \mathbf{a}^{-1} = & \frac{a^t}{a^{t2} - a^{x2} - a^{y2} - a^{z2}} \mathbf{e}_t \\ & + \frac{a^x}{a^{t2} - a^{x2} - a^{y2} - a^{z2}} \mathbf{e}_x \\ & + \frac{a^y}{a^{t2} - a^{x2} - a^{y2} - a^{z2}} \mathbf{e}_y \\ & + \frac{a^z}{a^{t2} - a^{x2} - a^{y2} - a^{z2}} \mathbf{e}_z \end{aligned}$$

$$\langle \mathbf{M} \rangle_1 \langle \mathbf{M} \rangle_1 = M^{t2} - M^{x2} - M^{y2} - M^{z2}$$

$$\begin{aligned} \langle \mathbf{M} \rangle_1^{-1} = & \frac{M^t}{M^{t2} - M^{x2} - M^{y2} - M^{z2}} \mathbf{e}_t \\ & + \frac{M^x}{M^{t2} - M^{x2} - M^{y2} - M^{z2}} \mathbf{e}_x \\ & + \frac{M^y}{M^{t2} - M^{x2} - M^{y2} - M^{z2}} \mathbf{e}_y \\ & + \frac{M^z}{M^{t2} - M^{x2} - M^{y2} - M^{z2}} \mathbf{e}_z \end{aligned}$$

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

$$\langle \mathbf{M} \rangle_3 \langle \mathbf{M} \rangle_3 = -M^{txy2} - M^{txz2} - M^{tyz2} + M^{xyz2}$$

$$\begin{aligned} \langle \mathbf{M} \rangle_3^{-1} = & - \frac{M^{txy}}{M^{txy2} + M^{txz2} + M^{tyz2} - M^{xyz2}} \mathbf{e}_t \wedge \mathbf{e}_x \wedge \mathbf{e}_y \\ & - \frac{M^{txz}}{M^{txy2} + M^{txz2} + M^{tyz2} - M^{xyz2}} \mathbf{e}_t \wedge \mathbf{e}_x \wedge \mathbf{e}_z \\ & - \frac{M^{tyz}}{M^{txy2} + M^{txz2} + M^{tyz2} - M^{xyz2}} \mathbf{e}_t \wedge \mathbf{e}_y \wedge \mathbf{e}_z \\ & - \frac{M^{xyz}}{M^{txy2} + M^{txz2} + M^{tyz2} - M^{xyz2}} \mathbf{e}_x \wedge \mathbf{e}_y \wedge \mathbf{e}_z \end{aligned}$$