

d = {{0, 1, 0, 0}, {0, 0, -N, 0}, {0, 0, 0, 1}, {-N, 0, 0, 0}}; MatrixForm[d]

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

unit = {{1, 0, 0, 0}, {0, 1, 0, 0}, {0, 0, 1, 0}, {0, 0, 0, 1}}; MatrixForm[unit]

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

MatrixForm[d.d]

$$\begin{pmatrix} 0 & 0 & -N & 0 \\ 0 & 0 & 0 & -N \\ -N & 0 & 0 & 0 \\ 0 & -N & 0 & 0 \end{pmatrix}$$

m1 = Sign[N] * d.d / N + unit; MatrixForm[m1]

$$\begin{pmatrix} 1 & 0 & -\text{Sign}[N] & 0 \\ 0 & 1 & 0 & -\text{Sign}[N] \\ -\text{Sign}[N] & 0 & 1 & 0 \\ 0 & -\text{Sign}[N] & 0 & 1 \end{pmatrix}$$

m2 = Sign[N] * d.d / N - unit; MatrixForm[m2]

$$\begin{pmatrix} -1 & 0 & -\text{Sign}[N] & 0 \\ 0 & -1 & 0 & -\text{Sign}[N] \\ -\text{Sign}[N] & 0 & -1 & 0 \\ 0 & -\text{Sign}[N] & 0 & -1 \end{pmatrix}$$

$$\mathbf{mf} = \text{Cos}[\varphi] * \text{unit} + \text{Sin}[\varphi] * \mathbf{d} / \sqrt{\text{Abs}[\mathbf{N}]} ; \text{MatrixForm}[\mathbf{mf}]$$

$$\mathbf{md} = \text{Cosh}[\varphi] * \text{unit} + \text{Sinh}[\varphi] * \mathbf{d} / \sqrt{\text{Abs}[\mathbf{N}]} ; \text{MatrixForm}[\mathbf{md}]$$

$$\begin{pmatrix} \text{Cos}[\varphi] & \frac{\text{Sin}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 & 0 \\ 0 & \text{Cos}[\varphi] & -\frac{\mathbf{N} \text{Sin}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 \\ 0 & 0 & \text{Cos}[\varphi] & \frac{\text{Sin}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} \\ -\frac{\mathbf{N} \text{Sin}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 & 0 & \text{Cos}[\varphi] \end{pmatrix}$$

$$\begin{pmatrix} \text{Cosh}[\varphi] & \frac{\text{Sinh}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 & 0 \\ 0 & \text{Cosh}[\varphi] & -\frac{\mathbf{N} \text{Sinh}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 \\ 0 & 0 & \text{Cosh}[\varphi] & \frac{\text{Sinh}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} \\ -\frac{\mathbf{N} \text{Sinh}[\varphi]}{\sqrt{\text{Abs}[\mathbf{N}]}} & 0 & 0 & \text{Cosh}[\varphi] \end{pmatrix}$$

$$\mathbf{sq} = (\mathbf{mf}.\mathbf{m1} - \mathbf{md}.\mathbf{m2}) / 2 ; \text{MatrixForm}[\text{Simplify}[\mathbf{sq}]]$$

$$\begin{pmatrix} \frac{1}{2} (\text{Cos}[\varphi] + \text{Cosh}[\varphi]) & \frac{\text{Sin}[\varphi] + \text{Sinh}[\varphi]}{2\sqrt{\text{Abs}[\mathbf{N}]}} & -\frac{1}{2} (\text{Cos}[\varphi] - \text{Cosh}[\varphi]) \text{Sign}[\mathbf{N}] & \frac{\text{Sign}[\mathbf{N}] (-\text{Sin}[\varphi] + \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} \\ \frac{\mathbf{N} \text{Sign}[\mathbf{N}] (\text{Sin}[\varphi] - \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} & \frac{1}{2} (\text{Cos}[\varphi] + \text{Cosh}[\varphi]) & -\frac{\mathbf{N} (\text{Sin}[\varphi] + \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} & -\frac{1}{2} (\text{Cos}[\varphi] - \text{Cosh}[\varphi]) \text{Sign}[\mathbf{N}] \\ -\frac{1}{2} (\text{Cos}[\varphi] - \text{Cosh}[\varphi]) \text{Sign}[\mathbf{N}] & \frac{\text{Sign}[\mathbf{N}] (-\text{Sin}[\varphi] + \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} & \frac{1}{2} (\text{Cos}[\varphi] + \text{Cosh}[\varphi]) & \frac{\text{Sin}[\varphi] + \text{Sinh}[\varphi]}{2\sqrt{\text{Abs}[\mathbf{N}]}} \\ -\frac{\mathbf{N} (\text{Sin}[\varphi] + \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} & -\frac{1}{2} (\text{Cos}[\varphi] - \text{Cosh}[\varphi]) \text{Sign}[\mathbf{N}] & \frac{\mathbf{N} \text{Sign}[\mathbf{N}] (\text{Sin}[\varphi] - \text{Sinh}[\varphi])}{2\sqrt{\text{Abs}[\mathbf{N}]}} & \frac{1}{2} (\text{Cos}[\varphi] + \text{Cosh}[\varphi]) \end{pmatrix}$$