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

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

$$\begin{pmatrix} -2^{-m/2} & -2\,\text{Sinh}\left[\frac{1}{2}\,m\,\text{Log}[2]\right] \\ -2^{-m/2} & 2^{-m/2} \end{pmatrix}$$

$$\begin{pmatrix} 2^{-m/2} & 2\,\text{Sinh}\left[\frac{1}{2}\,m\,\text{Log}[2]\right] \\ 2^{-m/2} & -2^{-m/2} \end{pmatrix}$$