```
> restart : with(LinearAlgebra) :
> A := Matrix([[0, -1, 0, -1], [1, 0, 0, 0], [0, 1, 0, 0], [0, 0, 1, 0]])
```

$$A := \begin{bmatrix} 0 & -1 & 0 & -1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \quad (1)$$

```
> J, Q := JordanForm(A, output = ['J', 'Q'])
```

$$J, Q := \begin{bmatrix} -\frac{1}{2} - \frac{\mathrm{I}\sqrt{3}}{2} & 0 & 0 & 0 \\ 0 & -\frac{1}{2} + \frac{\mathrm{I}\sqrt{3}}{2} & 0 & 0 \\ 0 & 0 & \frac{1}{2} - \frac{\mathrm{I}\sqrt{3}}{2} & 0 \\ 0 & 0 & 0 & \frac{1}{2} + \frac{\mathrm{I}\sqrt{3}}{2} \end{bmatrix}, \Bigg[\Bigg[\quad (2)$$

$$-\frac{1}{-3+\mathrm{I}\sqrt{3}}, \frac{\frac{\mathrm{I}}{3}\sqrt{3}}{-1+\mathrm{I}\sqrt{3}}, -\frac{1+\mathrm{I}\sqrt{3}}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)}, -\frac{1}{-3+\mathrm{I}\sqrt{3}}\Bigg],$$

$$\Bigg[-\frac{-1+\mathrm{I}\sqrt{3}}{2\left(-3+\mathrm{I}\sqrt{3}\right)}, \frac{1}{-3+\mathrm{I}\sqrt{3}}, -\frac{1}{-3+\mathrm{I}\sqrt{3}}, \frac{-1+\mathrm{I}\sqrt{3}}{2\left(-3+\mathrm{I}\sqrt{3}\right)}\Bigg],$$

$$\Bigg[-\frac{2}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)}, \frac{2}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)},$$

$$\frac{2}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)}, \frac{1+\mathrm{I}\sqrt{3}}{2\left(-3+\mathrm{I}\sqrt{3}\right)}\Bigg],$$

$$\Bigg[-\frac{1}{-3+\mathrm{I}\sqrt{3}}, -\frac{1+\mathrm{I}\sqrt{3}}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)}, \frac{1+\mathrm{I}\sqrt{3}}{\left(-3+\mathrm{I}\sqrt{3}\right)\left(-1+\mathrm{I}\sqrt{3}\right)},$$

$$\frac{1}{-3+\mathrm{I}\sqrt{3}}\Bigg]\Bigg]$$

```
> v := Vector([1, 0, 2, 1])
```

$$v := \begin{bmatrix} 1 \\ 0 \\ 2 \\ 1 \end{bmatrix} \tag{3}$$

> $result\_1 := simplify(MatrixExponential(t \cdot A) \cdot v)[4]$

$$result\_1 := \frac{2\left(\mathrm{e}^{-\frac{t}{2}} + \frac{3\,\mathrm{e}^{\frac{t}{2}}}{2}\right)\sqrt{3}\,\sin\left(\frac{t\sqrt{3}}{2}\right)}{3} + \mathrm{e}^{-\frac{t}{2}}\cos\left(\frac{t\sqrt{3}}{2}\right) \tag{4}$$

>

>