

## Tutorial 3

**Question 1** The transition matrix  $T$ , from a basis  $\mathcal{B}$  to a basis  $\mathcal{C}$  is given by

$$T = \begin{bmatrix} -1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -1 & -1 \end{bmatrix}$$

Does  $\mathcal{C}$  have the same or opposite orientation to basis  $\mathcal{B}$ ?

**Question 2** Let  $(\mathbf{e}, \mathbf{f})$  be an orthonormal basis for  $\mathbb{E}^2$ . For each of the following linear operators in  $\mathbb{E}^2$ , determine if they are a rotation, reflection or neither.

$$\begin{array}{lll} \mathbf{e} \mapsto -\mathbf{e} & \mathbf{e} \mapsto \mathbf{e} - \mathbf{f} & \mathbf{e} \mapsto -\frac{1}{2}\mathbf{e} + \frac{\sqrt{3}}{2}\mathbf{f} \\ \mathbf{f} \mapsto -\mathbf{f} & \mathbf{f} \mapsto 2\mathbf{e} + \mathbf{f} & \mathbf{f} \mapsto \frac{\sqrt{3}}{2}\mathbf{e} + \frac{1}{2}\mathbf{f} \end{array}$$

If they are a rotation or reflection, give their angle of rotation/reflection.