Solution (#804) We may identify the space V of polynomials in x of degree 3 or less with $\mathbb{R}_4$ by $ax^3 + bx^2 + cx + d \longleftrightarrow$ (a, b, c, d). Note that under the given identification the standard basis for $\mathbb{R}_4$ corresponds to $1, x, x^2, x^3$.

$$
S = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}, \qquad T = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \qquad U = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 3 \end{pmatrix}.
$$