

1. Let $B = \{(1, 1, 0), (1, 0, 1), (0, 1, 1)\}$ and $C = \{(1, 0, -1), (1, 0, 0), (0, -1, 1)\}$, two bases of \mathbf{R}^3 . Find the transition matrix from B to C .

2. Let $T(x, y, z) = (3x - 2y, 4z - x, 2x - y, 4z - y)$. Find a matrix A such that $T(\mathbf{x}) = A\mathbf{x}$.

3. If $U = \begin{bmatrix} u_1 & u_2 \\ 0 & u_3 \end{bmatrix}$ and $V = \begin{bmatrix} v_1 & v_2 \\ 0 & v_3 \end{bmatrix}$, define $U \cdot V = u_1v_1 + u_3v_3$. Determine whether this formula defines an inner product on the space of all 2×2 upper triangular matrices.