You may use your book for this quiz. You may also use your calculator as needed; just be sure to tell me what you have done.

1. Define \( T : \mathbb{R}^3 \to \mathbb{R}^2 \) by \( T(x, y, z) = (3x + y, z - 2x) \). Let \( B = \{ (1,1,0), (1,0,1), (0,1,1) \} \) and \( C = \{ (1,2), (2,1) \} \). Find the matrix of \( T \) relative to \( B \) and \( C \).

**Solution:** We have \( T(1,1,0) = (4, -2) = 4(1,1) - 6(0,1) \), \( T(1,0,1) = (3, -1) = 3(1,1) - 4(0,1) \), and \( T(0,1,1) = (1,1) = 1(1,1) + 0(0,1) \). Thus

\[
[T : B, C] = \begin{bmatrix} 4 & 3 & 1 \\ -6 & -4 & 0 \end{bmatrix}.
\]