1. Find all complex numbers which are equal to (one of) their own roots of order 7.

2. $R = \{v_1, v_2, v_3\}$ is a basis for $\mathbf{R}^3$.

   (a) Is $S = \{v_1+v_2, v_2+v_3, v_3+v_1\}$ a basis for $\mathbf{R}^3$?

   (b) If the answer to (a) is YES: what is the matrix of F in S, where $F(x,y,z) = (x,y,z)$

3. $F:\mathbf{R}_n[x] \to \mathbf{R}_n[x]$, $F(f)=f'$. Prove that F is a linear mapping. Find $ker(F)$ and $im(F)$.

4. Find a diagonal matrix D similar to the matrix $A = \begin{bmatrix} 0 & -3 & -1 & 1 \\ 2 & 5 & 1 & -1 \\ -2 & -3 & 1 & 1 \\ 2 & 3 & 1 & 1 \end{bmatrix}$.

5. Find the inverse matrix for $A = \begin{bmatrix} -1 & -1 & -1 & -1 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 2 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$. Verify you answer by matrix multiplication.