NAME

Time 120 min. Each task is 12 points. Include all necessary comments and calculations. SUBMIT THESE SHEETS ONLY. Do not talk, cheat or else...!

1. (a) R={r_1,r_2, … ,r_k} and S={s_1,s_2, … ,s_k} are bases of some vector space V over a field **K** and φ is a linear operator on V**.** Quote the definition of M_S^R(φ).
   (b) Let φ(x,y,z) = (z,x+y+z,y+z). Find M_S^R(φ) where R={(1,0,0),(0,1,0),(0,0,1)} and S={(1,1,1),(1,1,0),(0,1,1)}.
2. Find the polar form of z = $\left(\frac{\sqrt{3}-1+(\sqrt{3}+1)i}{2-2i}\right)^5$. *Hint. Represent the numerator as a sum of two complex numbers of equal moduli*.
3. Is the set {(1,1,i),(1+i,1-i,2i),(1,1+i,2i)} linearly independent in **C**^{3} over **C.**
4. A = M_R(F) and B = M_S(F). Prove that det A = det B. *Hint*: det XY= detX detY.
5. (a) Quote the definition of an eigenvalue and eigenvector of a linear operator F.
   (a) Find P such that D=P^{-1}AP, where D = $\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 0 & 0 & 2\end{bmatrix}$ and A = $\begin{bmatrix}5 & -1 & 5\\ -3 & 3 & -5\\ -3 & 1 & -3\end{bmatrix}$.