NAME 11 FEB 2016

MiNI - ALGEBRA - FINAL EXAM - time allowed 120 minutes.
Do not talk, cheat or else...!

1. F is a linear operator such that F(3,2,2) = (3,1,2), F(1,2,1) = (2,2,3) and F(2,3,2) = (5,-1,0). If possible, find kernel(F). If not possible, explain why.
2. Prove that the set G of all complex roots of 1, of all possible orders is an Abelian group with respect to multiplication. (G=$\{z \in C : (\exists n \in N) z^n = 1\}$)
3. $J = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ $A = \begin{bmatrix} 3 & -1 & -3 \\ -1 & 3 & 3 \\ 1 & -1 & -1 \end{bmatrix}$. Find a matrix P such that $J=P^{-1}AP$. Hint: *it exists!*
4. Consider C a vector space over R. Verify that f(z) = $\bar{z}$ is a linear operator. Find eigenvalues of f, for each eigenvalue find an eigenvector.
5. Solve in complex numbers the equation $z^4 = (-3+5i)^4$