

Q4i: We know from matrix multiplication that the left ideal of E_{ij} will be all matrices which are zero everywhere except possibly the j 'th column.

Q4ii: Similarly to 4i, we have that the right ideal will be given by matrices with zero entries everywhere except possibly the i 'th row.

Q4iii: From properties of matrix multiplication, we know that the two sided ideal generated by E_{ij} will be the set of all matrices with nonzero entries everywhere except possibly the ij 'th component of the matrix.

Q4iv: Given a matrix $M \in \mathcal{R}$, we consider the two sided ideal generated by it, RMR . Any matrix in RMR can be written as the sum of matrices in the form rMs for $r, s \in \mathcal{R}$. We can choose r, s such that we get a matrix K which is the same rank, k as M , with k 1's on the diagonal. From here we can generate every matrix with rank less than or equal to M . Thus we are done.