a) Note that we can write \( M(R, \alpha) \) as the product \( M(R\alpha) = M(I, \alpha) M(R, 0) \). See "relation" 1 of Theorem 35. It is easy to write each factor in exponential form which, by theorem 37, is enough.

We have \( M(R, 0) = \begin{pmatrix} R & 0 \\ 0 & 0 \end{pmatrix} \). Let \( R = R(\tilde{A}, \theta) \), + 

\[ \text{let } \tilde{J} \overset{\text{def}}{=} \begin{pmatrix} \tilde{J} & 0 \\ 0 & 0 \end{pmatrix} \]

Then, \( e^{\tilde{A} \cdot \tilde{J}} = \begin{pmatrix} R(\tilde{A}, \theta) & 0 \\ 0 & 0 \end{pmatrix} = M(R, 0) \)

Next work on \( M(I, \alpha) = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \) Consider the matrix \( P_1 = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \). Then, \( P_1^2 = 0 \), + \( \alpha_1 P_1 = I + \alpha_1 P_1 \)

Thus, \( M(I, \alpha) = e^{\beta \cdot \tilde{P}} \) where

b) \( \tilde{J}'s + \tilde{P}'s \) form a basis with C.R.:

\[ [\tilde{J}_i, \tilde{J}_k] = \sum_k \epsilon_{ijk} \tilde{J}_k \]

\[ [\tilde{J}_i, \tilde{P}_k] = \sum_k \epsilon_{ijk} \tilde{P}_k \]

\[ [\tilde{P}_i, \tilde{P}_k] = 0 \]

Relations obtained using the matrices above. Lie Algebra has dimension 6.