$$|\mathbf{I} + \epsilon\,\mathbf{M}| = \begin{vmatrix} 1 + \epsilon\,M_{11} & \epsilon\,M_{21} & \epsilon\,M_{31} & \epsilon\,M_{41} & \epsilon\,M_{51} \\ \epsilon\,M_{12} & 1 + \epsilon\,M_{22} & \epsilon\,M_{32} & \epsilon\,M_{42} & \epsilon\,M_{52} \\ \epsilon\,M_{13} & \epsilon\,M_{23} & 1 + \epsilon\,M_{33} & \epsilon\,M_{43} & \epsilon\,M_{53} \\ \epsilon\,M_{14} & \epsilon\,M_{24} & \epsilon\,M_{34} & 1 + \epsilon\,M_{44} & \epsilon\,M_{54} \\ \epsilon\,M_{15} & \epsilon\,M_{25} & \epsilon\,M_{35} & \epsilon\,M_{45} & 1 + \epsilon\,M_{55} \end{vmatrix}$$

$$= (1 + \epsilon\,\mathrm{tr}\,\mathbf{M}) + O(\epsilon^2)$$