(1) Using transformation equations for $E$ and $B$, find the transformation for $B \cdot E$ and comment on the rank of this tensor.

(2) 4.6.13, 10.3.8, 10.3.9 from Arfken’s book

(3) Show that $\delta_{ij}$ is a second rank tensor and $\epsilon_{ijk}$ is a third rank tensor

(4) If $J$ is the generator of $SO(3)$ in frame A, what would the generator be in the frame B rotated by an angle 30 degrees w.r.t (A) about $y$-axis. What would the generator be in frame C rotated by 45 degrees w.r.t frame B about x-axis??

(5) Using second order Taylor expansion, Show that planar rotations about $x$ and $y$ axes do not commute