Date
21/08/2020

Assignment 5 (MA31007)

(Mathematical Methods)

Q1) Show that if a tensor is skew-symmetric with respect to a pair of indices in one system of co-ordinates, it is so in every system.

Q2) Prove that if the components of a tensor vanishes in one co-ordinate system, they vanish identically in all co-ordinate systems.

Q3) Explain the process of contraction of tensors. Show that $a_{ij} a^{ij} = \delta^{i}_{j}$.

Q4) If A^i is an ambitrary contravariant vector & $C_{ij} A^i A^j$, is an invariant, show that $(C_{ij} + C_{ji})$ is a covariant tensor of the second order.

Q5) Prove that $\begin{Bmatrix} i \\ i\,j \end{Bmatrix} = \dfrac{\partial \log(\sqrt{g})}{\partial x^j}$.

Q6) Determine the number of independent components of Christoffel symbols. Also show that the laws of transformations of Christoffel's symbols posses 'group' properties (ie., transitive property).

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