Reply to Anih-

In question 9, the comma denotes a differentiation with
respect to the respective coordinate.

Consequently, $\phi_{,j}$ is $\frac{\partial \phi}{\partial x_j}$ so that when $j = 1$,

it means $\frac{\partial \phi}{\partial x}$, when $j = 2$, it means $\frac{\partial \phi}{\partial y}$,

and when $j = 3$, it means $\frac{\partial \phi}{\partial z}$

Reply to Fope

The site you visited is good. The conditions they gave are correct. To explain further, consider two equations

$$T_{ij} + \epsilon_{ijk}\sigma_k = A_i B_j$$

and

$$T_{ik} + \epsilon_{ijk}\sigma_k = A_i B_j$$

The first equation is proper while the second is improper.

If you look at the first equation, the index k is repeated. It is a dummy index. In that term, the indices i and j are not repeated. These “free indices” must appear in the same way on each term. As you can see, this is the case in the first equation for the free indices occur as expected.

The situation is different in the second equation. It is improper that the index j is absent in the first term. A free index on any term MUST appear on each term in the equation. Dummy indices can be replaced by any

other to ensure that no indices occur more than twice in any term.