

Homework #5

Problem 1 - 4.1.8:

$T_{ijk\dots}$ is a tensor of rank n .

$$\sum_j \frac{\partial T_{ijk\dots}}{\partial x_j} = \partial^j T_{ijk\dots} = C_{i\hat{j}k\dots},$$

where \hat{j} indicates that the index j is no longer there. Since the derivative is a tensor of rank 1 its direct product with T gives a tensor of rank $n+1$, the contraction of the index j reduces the rank of this tensor by 2, i.e. $n+1-2 = n-1$. Thus C is a tensor of rank $n-1$. Notice that since we are using cartesian coordinates we have not used covariant and contravariant placements for the indices.