Problem 1 - 4.1.8:

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

$$
\sum_j \frac{\partial T_{ijk...}}{\partial x_j} = \partial^j T_{ijk...} = C_{ijk...},
$$

where $^j$ 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.