

Homework Physics 451 Fall 2003

Vector Spaces and Tensor Analysis

§11. Algebraic Properties of Contravariant and Covariant Tensors

1. Show that the statement we made in class (and in Einstein's Lectures) is correct: If A_μ^ν is a tensor and $B_{\sigma\tau}$ is a tensor, then $C_{\mu\sigma\tau}^\nu$ is a tensor, where

$$C_{\mu\sigma\tau}^\nu = A_\mu^\nu B_{\sigma\tau}$$

2. Consider the relations $v_\nu = A_{\nu\mu} u^\mu$, where v is a covariant tensor of rank-1 for any arbitrary contravariant tensor u of rank-1. Show that $A_{\nu\mu}$ must be a covariant tensor of rank-2. (This is sometimes called the *quotient rule* or *quotient law*.)