Exercise 04

Please attempt all of the following problems before the due date. Your grade on this assignment will be calculated from the best two answers.

Problem 04.1

Show that, for two vectors $u, v$, the tensor product $u \otimes v$ has components:

$$u \otimes v (\omega^r, \omega^s) = u^rv^s$$

Answer 04.1

Put all of your calculations here. When you have completed all of the problems, wrap the resulting file and e-mail it to me at rgowdy@saturn.vcu.edu.

Problem 04.2

Show that the generalized trace or tensor contraction defined in the notes gives us yet another way to write the result of a form $\alpha$ acting on a vector $v$.

$$\text{Tr} (\alpha \otimes v) = \alpha (v) = \alpha \cdot v = v \cdot \alpha = v (\alpha) = [\alpha] [v].$$

Answer 04.2

Put all of your calculations here. When you have completed all of the problems, wrap the resulting file and e-mail it to me at rgowdy@saturn.vcu.edu.

Problem 04.3

Consider a second rank covariant tensor $K$ and find a way to obtain the number $K (u, v)$ by contracting the fourth rank tensor $K \otimes u \otimes v$.

Write this contraction using the generalized trace symbol $\text{Tr}^m$ (with the indexes omitted when they equal one) and then indicate what sort of contraction would be needed to obtain $K (u, v)$ from the tensor $K \otimes v \otimes u$.

Answer 04.3
Put all of your calculations here. When you have completed all of the problems, wrap the resulting file and e-mail it to me at rgowdy@saturn.vcu.edu.