

1. GR 5.10
2. GR 5.12
3. GR 5.13
4. GR 5.14
5. GR 5.16
6. Let F_{ab} be an EM field. Show that

$$\nabla_{[a}F_{bc]} = 2(\nabla_a F_{bc} + \nabla_c F_{ab} + \nabla_b F_{ca}).$$

Then show that Maxwell's equations for the EM field F_{ab} can be written

$$\nabla_a F^{ab} = \epsilon_0^{-1} J^b \tag{1}$$

$$\nabla_{[a}F_{bc]} = 0. \tag{2}$$

where J^b is the current-density 4-vector (ρ, j^1, j^2, j^3) .

7. Suppose S_{ab} and T_{ab} are symmetric tensors and $S_{ab}V^aV^b = T_{ab}V^aV^b$ for all timelike unit vectors V^a . Show that $S_{ab} = G_{ab}$