

Homework 2

1. Srednicki problem 22.1
2. Srednicki problem 22.2
3. Srednicki problem 22.3
4. Srednicki problem 24.3
5. Srednicki problems 55.1 and 55.2
6. Show that $SU(2)$ is the double-cover of $SO(3)$ (Rubakov problem 18). Similarly, show that $SL(2, R)$ is the double-cover of $SO(2, 1)$ and that $SL(2, C)$ is the double-cover of $SO(3, 1)$.
7. Use Noether's theorem to derive the canonical stress energy tensor $T^{\mu\nu}$ for Maxwell theory coupled to an external conserved current, described by the action

$$S = \int d^4x \left[-\frac{1}{4} F^{\mu\nu} F_{\mu\nu} + J^\mu A_\mu \right].$$

Is $T^{\mu\nu}$ symmetric under exchange of the indices μ and ν ? Is it invariant under a gauge transformation $A_\mu \rightarrow A_\mu + \partial_\mu \lambda$?