Problems for Quantum Field Theory 2

7. Tutorial

Problem 1: *Bianchi identity*
Consider the covariant derivative in the adjoint representation

$$D_\mu^{ac} = \partial_\mu \delta^{ac} - g f^{abc} A_\mu^b.$$

Show that the Field strength tensor

$$F_{\mu\nu}^a = \partial_\mu A_\nu^a - \partial_\nu A_\mu^a - g f^{abc} A_\mu^b A_\nu^c$$

satisfies the Bianchi identity

$$\epsilon^{\mu\nu\lambda\sigma} (D_\nu F_{\lambda\sigma})^a = 0.$$

What is the analog of this equation for abelian gauge theory?

(You may want to use the identity

$$f^{ade} f^{bcd} + f^{bde} f^{cad} + f^{cde} f^{abd} = 0.)$$