

The last term can be rewritten

So we need to compute terms like

Putting everything together, we have

$$\Rightarrow W^\alpha W_\alpha|_{\theta^2} = i \theta^2 (\lambda \sigma^\mu \partial_\mu \bar{\lambda}) + \theta^2 D^2 - \frac{1}{2} \theta^2 f_{\mu\nu} f^{\mu\nu} + \frac{i}{2} \theta^2 \varepsilon^{\mu\nu\rho\sigma} f_{\mu\nu} f_{\rho\sigma}$$

Non-Abelian gauge theories in superspace

The gauge transformation is

where Λ is a chiral superfield
and $\bar{\Lambda}$ is its complex conjugate
(anti-chiral).

$$W_\alpha = -\frac{1}{4} \bar{D}^2 (e^{-2V} D_\alpha e^{2V}) \quad , \quad \bar{W}_\dot{\alpha} = -\frac{1}{4} D^2 (e^{2V} \bar{D}_{\dot{\alpha}} e^{-2V})$$

The action can be written

$$S = \frac{1}{32\pi} \int d^4x \, \text{tr} \left(-\frac{1}{4} f_{\mu\nu} f^{\mu\nu} - i(\lambda \sigma^\mu D_\mu \lambda) + \frac{1}{2} D^2 \right)$$