Construct F-term out of bilinear:
- only need $\theta\theta$ terms. (6 terms)

$$W^\alpha W_\alpha = \ldots + i(\theta\theta)\,\lambda^\alpha(\sigma^\mu\partial_\mu\lambda^\dagger)_\alpha + \theta^\alpha\theta_\alpha D^2 - \theta^\alpha\sigma^{\mu\nu}\theta_\alpha F_{\mu\nu}D$$

$$+ (\theta\sigma^{\mu\nu})^\alpha\theta_\alpha F_{\mu\nu}D - (\theta\sigma^{\mu\nu}\sigma^{\rho\sigma}\theta)F_{\mu\nu}F_{\rho\sigma} - i(\theta\theta)(\partial_\mu\lambda^\dagger\bar\sigma^\mu\lambda)$$

$$-\tfrac{1}{2}(\theta\theta)\,\mathrm{Tr}[\sigma^{\mu\nu}\sigma^{\rho\sigma}]$$ Martin's SUSY (4.1.12)

$$= -\tfrac{1}{2}(\theta\theta)\,\tfrac{1}{2}(g^{\mu\rho}g^{\nu\sigma} - g^{\mu\sigma}g^{\nu\rho} - i\epsilon^{\mu\nu\rho\sigma})$$ Martin (2.90)

Contract with $F_{\mu\nu}F_{\rho\sigma}$

$$= -\tfrac{1}{4}(\theta\theta)(g^{\mu\rho}g^{\nu\sigma} - g^{\mu\sigma}g^{\nu\rho} - i\epsilon^{\mu\nu\rho\sigma})F_{\mu\nu}F_{\rho\sigma}$$

$$= -\tfrac{1}{4}(\theta\theta)(F_{\mu\nu}F^{\mu\nu} - F_{\mu\nu}\overset{\ominus}{F^{\nu\mu}} - i\epsilon^{\mu\nu\rho\sigma}F_{\mu\nu}F_{\rho\sigma})$$

$$= (\theta\theta)\left[-\tfrac{1}{2}F_{\mu\nu}F^{\mu\nu} + \tfrac{i}{4}\epsilon^{\mu\nu\rho\sigma}F_{\mu\nu}F_{\rho\sigma}\right]$$

$$W^\alpha W_\alpha = \ldots(\theta\theta)\left[i\lambda^\alpha(\sigma^\mu\partial_\mu\lambda^\dagger)_\alpha - i(\partial_\mu\lambda^\dagger\bar\sigma^\mu\lambda) + D^2 - \tfrac{1}{2}F_{\mu\nu}F^{\mu\nu} + \tfrac{i}{4}\epsilon^{\mu\nu\rho\sigma}F_{\mu\nu}F_{\rho\sigma}\right]$$

Terms displayed are same in x^μ and y^μ coordinates.

canonical normalization

$$S = \ldots\int d^4x\ \tfrac{1}{2}[W^\alpha W_\alpha]_F$$

$$= \ldots\int d^4x\left[\tfrac{1}{2}i\lambda\sigma^\mu\partial_\mu\lambda^\dagger - \tfrac{1}{2}i(\partial_\mu\lambda^\dagger)\bar\sigma^\mu\lambda + \tfrac{1}{2}D^2 - \tfrac{1}{4}F_{\mu\nu}F^{\mu\nu} + \underbrace{\tfrac{i}{8}\epsilon^{\mu\nu\rho\sigma}F_{\mu\nu}F_{\rho\sigma}}\right]$$

IBP: $\ominus$ Flip: $\ominus$ — IBP $\to \ominus$

not real, but total derivative $\to$ for U(1) theory, no surface term (drop)

$$= \ldots\int d^4x\left[\lambda^\dagger i\bar\sigma^\mu\partial_\mu\lambda + \tfrac{1}{2}D^2 - \tfrac{1}{4}F_{\mu\nu}F^{\mu\nu}\right]$$