Introduction to supergravity 2015: Exercise 6.

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Our superspace conventions are found in [1]. The components of the chiral superfield

$$\bar{\mathcal{D}}_{\dot{\alpha}}\Phi = 0 \tag{1}$$

are defined as

$$\begin{aligned} \Phi| &= A \\ \frac{1}{\sqrt{2}}\mathcal{D}_\alpha\Phi| &= \chi_\alpha \\ -\frac{1}{4}\mathcal{D}^2\Phi| &= F. \end{aligned} \tag{2}$$

We saw that the local supersymmetry transformations (or supergauge transformations) for the chiral superfield are given by

$$\delta\Phi = -\xi^A\mathcal{D}_A\Phi. \tag{3}$$

Note that if the superfield Φ was not a Lorentz scalar this supergauge transformation would be accompanied by the appropriate compensating field dependent change of frame such that we stay in the WZ gauge for the gravitational multiplet.

By using the components definition (2) and the transformation definition (3) find the transformation for the component fields of the chiral superfield

$$\begin{aligned} \delta A &=? \\ \delta\chi_\alpha &=? \\ \delta F &=? \end{aligned} \tag{4}$$

and express your results in terms of supercovariant derivatives.

References

[1] J. Wess and J. Bagger, "Supersymmetry and supergravity," Princeton, USA: Univ. Pr. (1992) 259 p