Introduction to supergravity 2015: Exercise 4.

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Here we work with the linearized old-minimal supergravity [1]. Prove the following Bianchi identities for the supergravity superfields $G_{\alpha\dot\alpha}$ and $\mathcal{R}$

$$(G_a)^* = G_a, \tag{1}$$

and

$$\bar{D}^{\dot\alpha} G_{\alpha\dot\alpha} = D_\alpha \mathcal{R}. \tag{2}$$

Calculate the highest component of the chiral superfield $\mathcal{R}$

$$-\frac{1}{4} D^2 \mathcal{R}| \tag{3}$$

in the appropriate WZ gauge. Which gravitational object resides in this component?

References

[1] S. Ferrara and B. Zumino, "Structure of Conformal Supergravity," Nucl. Phys. B **134**, 301 (1978).