UNIVERSITY OF CALIFORNIA, SANTA BARBARA
Department of Physics

Prof. S.B. Giddings **Physics 229A** Winter 2007

Gauge Theories

ASSIGNMENT #7 (corrected)

Due Thursday, March 1, 2007

1. For a real superfield V, derive the explicit superspace expansion of

$$W_\alpha = -\frac{1}{4}\bar{D}^2 D_\alpha V$$

and verify the expression given in class.

2. Use the definition of W_α to prove

$$D^\alpha W_\alpha = \bar{D}^{\dot{\alpha}} \bar{W}_{\dot{\alpha}}$$

3. a) Derive the component-field action for a real superfield, beginning from

$$\mathcal{L}_{\rm gauge} = \frac{1}{4g^2}\int d^2\theta\ W^\alpha W_\alpha \quad + \text{h.c.}\ ,$$

thus verifying the formula from class.

b) Extend your result to the case where g^2 is complex.

4. Derive the explicit form of the supersymmetry transformations for the gauge invariant fields $F_{\mu\nu}$, λ, and D.

5. Beginning with the superfield lagrangian for SQED, perform the superspace integrations to derive the component-field lagrangian. (Hint: you may find Wess-Zumino gauge useful.)