# Physics 8911 Problem Set 1

**Due in class Monday, February 7, 2005**

**1.** Show that in the Weyl basis

$$\gamma^5 = \gamma^0\gamma^1\gamma^2\gamma^3 = \begin{pmatrix} -i & 0 \\ 0 & i \end{pmatrix} .$$

**2.** Prove the following identities for two-component spinors:

$$\theta^\alpha\theta^\beta = -\frac{1}{2}\epsilon^{\alpha\beta}\theta\theta ,$$

$$\theta\sigma^m\bar{\theta}\theta\sigma^n\bar{\theta} = -\frac{1}{2}\theta\theta\bar{\theta}\bar{\theta}\eta^{mn} ,$$

$$(\theta\phi)(\theta\psi) = -\frac{1}{2}(\phi\psi)(\theta\theta) .$$

**3.** Rewrite the N=1 supersymmetry algebra

$$\{Q_\alpha, \bar{Q}_{\dot{\alpha}}\} = 2\sigma^m_{\alpha\dot{\alpha}}P_m ,$$

$$\{Q_\alpha, Q_\beta\} = 0 = \{\bar{Q}_{\dot{\alpha}}, \bar{Q}_{\dot{\beta}}\} ,$$

$$[Q_\alpha, P_m] = 0 = [\bar{Q}_{\dot{\alpha}}, P_m] ,$$

in terms of four-component Majorana spinors.