1312.3824.

8. Show $(\vec{\sigma}\cdot\vec{w})^2 = \vec{w}^2$

$$(\vec{\sigma}\cdot\vec{w})^2 = (\sigma_1 w_1 + \sigma_2 w_2 + \sigma_3 w_3)^2$$

$$= \sigma_1^2 w_1^2 + \sigma_1\sigma_2 w_1 w_2 + \sigma_1\sigma_3 w_1 w_3$$
$$+ \sigma_2\sigma_1 w_1 w_2 + \sigma_2^2 w_2^2 + \sigma_2\sigma_3 w_2 w_3$$
$$+ \sigma_3\sigma_1 w_1 w_3 \quad \sigma_3\sigma_2 w_2 w_3 \quad \sigma_3\sigma_2 w_3^2$$

The off diagonal terms cancel each other by the anticommutation rule $\{\sigma_i, \sigma_j\} = 2\delta_{ij}$

$\Rightarrow$ we get $(\vec{\sigma}\cdot\vec{w})^2 = \vec{w}^2$.