Exercise 6

The kinetic energy of rotation of the rigid structure in Exercise 5 is

$$K = \sum_v \frac{1}{2} m_v \Big(\dot{\mathbf{R}}_v \cdot \dot{\mathbf{R}}_v \Big)$$

where $\dot{\mathbf{R}}_v = [\mathbf{W} \times \mathbf{R}_v]$ is the velocity of the vth particle. Show that

$$K = \frac{1}{2} (\mathbf{\Phi} : \mathbf{WW})$$