PHY661: Topics in CM-QM, Jan-April 2015: Assignment 3, Due March 8, 2015

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1. Derive expression (2.31) for the geometric phase.

2⋆. Verify the result (2.36) for geometric phases near a two fold degeneracy; ie derive eqns. (2.32) to (2.36).

3. Show that $L[C]$ as in (3.20) is a ray space quantity.

4⋆. Derive the differential equation for geodesics, show that, the general structure is as in eq. (3.21).

5. Show that the definition of $\varphi_{\text{geom}}[C]$ in (4.2) is independent of the lift $mathcalC$ used to calculate $\varphi_{\text{tot}}[\mathcal{C}]$ and $\varphi_{rmdyn}[\mathcal{C}]$.

6. Prove eq. (4.3) using the geodesic description in (3.21).

7⋆. Use April 2013 issue of Resonance to reproduce Pancharatnam's ideas, especially his 'in phase' concept; and derive his result as given in eqn. (4.11).

8. Derive the Weyl formula (4.30) from the Heisenberg relation (4.29).