QUANTUM MECHANICS H.W №1

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PROBLEM (1)

Show that the Hamiltonian for a particle of mass m, orbiting a mass M, and they interact gravitationally is gien by:

$$H = \frac{L^2}{2I} + G\,\frac{M\,m}{r}$$

Then derive the equations of motion for this system, comment on your results.

PROBLEM (2)

Derive and solve the equation of motion for a 2-D SHO, with $m = 1$ and $\omega = 1$.

PROBLEM (3)

Show that :

$$\{p_j, H\} = \frac{\partial p_j}{\partial t}$$

PROBLEM (4)

Draw the shape of the phase space for a particle free-falling from altitude y_0

PROBLEM (5)

Discuss conserved quantities, and Neother's theorem in light of Hamiltonian dynamics.