Homework Assignment #6

(due: Wednesday, October 10, 11:30 pm)

1. Helix: Taylor problem (13.5)
Hint: For the interpretation with Newtonian mechanics make a sketch of how much rise and run you get for one cycle. So translate the problem to an inclined plane. (8P)

2. Particle in Two Dimensions: Taylor problem (13.10)
Hint: Once you have written down Hamilton's equations, find $\ddot{x}$ and $\ddot{y}$ and solve the resulting DEs. (7P)

3. Particle on Cylinder: Taylor problem (13.13)
Hint: Once you have written down Hamilton's equations, find $\ddot{z}$ and interpret your equation for $\dot{p}_\phi$. (7P)

4. Ignorable Coordinates: Taylor problem (13.22) (7P)

5. Canonical Transformations: Taylor problem (13.25)
Comment: This illustrates that the Hamilton formalism permits to transform the coordinates such that one ends up with DEs which are analytically solvable. The allowed coordinate transformations are called "canonical transformations." To know which canonical transformation to use, i.e. which coordinates are the best, the so called "Hamilton-Jacobi theory" is used. This approach is the big advantage of the Hamilton formalism in comparison with the Lagrange Method. (9P)

6. Phase-Space: Taylor problem (13.28) (7P)

7. Liouville's Theorem: Taylor problem (13.36) (5P)