Physics 3210 Spring 2015 Homework Set 7. Due at 12PM on Mar. 12, 2015

Book Problems (Mainly)

1. (5 points) Taylor problem 13.24
2. (10 points) Taylor problem 13.25
3. (5 points) For the canonical transformation in the book problem 13.25 show that the Poisson brackets \([Q, P]_{q,p} = 1\)
4. (10 points) Taylor Problem 9.4
5. (10 points) A uniform rod of mass M and length L is pivoted at one end. The pivot is attached to the top of a car accelerating at rate A, as shown.
   a. (5 points) What is the equilibrium value of the angle \(\theta\) between the rod and the top of the car?
   b. (5 points) Suppose that the rod is displaced a small angle \(\delta \theta\) from equilibrium. What is its motion for small \(\delta \theta\)
6. Extra Credit: Prove that the Poisson bracket of two quantities is a constant under canonical transformations. What I mean is prove that:
   \([u, v]_{p,q} = [u, v]_{Q,P}\)
   Where P and Q are a canonical variable transformation from p and q. Hint: one way to do this is to realize that the Poisson bracket can be seen as the determinant of a Jacobian and use what the determinant of the product of two matrices is.