

Problem Set II: Due Tuesday, February 4, 2014

- 1.) Fetter and Walecka 6.6
- 2.) Fetter and Walecka 6.7
- 3.) Fetter and Walecka 6.8
- 4.) Fetter and Walecka 6.17
- 5.)
 - a.) Derive the generating function and transformation rules for a “momentum change of variables” where $P = g(p)$, and g is a given function. Show directly that phase volume is conserved.
 - b.) Show that if a canonical transformation takes $p, q \rightarrow P, Q$, then $\frac{dP}{dt} = \frac{-\partial H'}{\partial Q}$, where H' is the new Hamiltonian.
- 6.) Find the frequencies of a three-dimensional harmonic oscillator with un-equal force constants, using the method of action-angle variables.
- 7.) Use a reduced form of the variational Principle discussed in class to show that Action is an adiabatic invariant for an oscillator with slowly varying parameter. Discuss the connection of this exercise to the WKB calculation discussed in class.