

Physics 505 - Autumn 2010

HW II

Due 10/13/10

Overview: Recall that solving physics problems is not (just) about solving differential equations. Use physical reasoning to solve the following exercises and be certain to show your work.

- 1) Fetter & Walecka - 1.10 (7 pts) Here we want to analyze the r^2 potential much as we did the $1/r$ potential. Be certain to note the similarities and differences in the two cases, especially the fact that both produce closed, stable orbits.
- 2) Fetter & Walecka - 1.11 (4 pts) The question here is what happens when the central potential is more singular than the angular momentum barrier. Consider whether our methods are reliable for motion near the origin in such a potential, *i.e.*, do any of our approximations break down?
- 3) Fetter & Walecka - 1.14 (2 pts) The strong (nuclear) interactions are short range and serve to define the size of the nucleus. The questions here is – how much is the size of the cross section for the interaction between 2 nuclei reduced by their repulsive E&M interaction? HINT: HINT: Recall problem 1.13, Ex. 4) in HW I.
- 4) Fetter & Walecka - 1.18 (7 pts) Here we want to think about the general scattering problem for a general central potential $V(\rho)$ in the small angle (large impact parameter), impulse approximation (the interaction effectively occurs for only a short time). This is often a useful starting point.
- 5) Fetter & Walecka – 2.4 (5 pts) This is a problem in analyzing motion in a rotating frame.