PHYSICS 633

Reminder: The Final Exam will be on Friday, May 30
6:30 PM – 8:30 PM in Smith 1180

Home Work Assignment # 8 (The last one!) 05/21/2008

Due: Thursday, May 29, 2008

All problem numbers are from the text book by Griffiths.

• **Probability current density**: In our study of scattering theory we have used the probability current density to compute incident and scattered fluxes. The following problems will help you review this concept and understand it in detail.

1) Problem 1.14 (a) on page 21.

2) Problem 2.19 on page 66.

3) Problem 4.41 (a) on page 191. Show also that Eq. (4.193) can also be written as

$$\mathbf{J}(\mathbf{r},t) = \frac{\hbar}{m}\mathrm{Im}\left\{\Psi^*\nabla\Psi\right\}.$$

• **One-dimensional scattering problem**:

4) Review Section 2.6 and then solve Problem 2.34 (a,b,c,d) on page 83-84. In part (c) compute the probability currents and find the transmission coefficient $T = J_t/J_i$. (Please do not use eq. (2.98)).

• **Scattering in one and two dimensions**:

5) Problem 11.2 on page 399.

• **Born Approximation**:

6) Problem 11.10 on page 416. The "soft-sphere" potential is defined in eq. (11.81).

7) Problem 11.12.

8) Problem 11.13 (a) and (b).
Please note: Griffiths uses the notation $D(\theta,\phi)$ for the differential scattering cross-section that I called $\sigma(\theta,\phi)$ in class. His σ (without any angular arguments) is the total scattering cross-section.