PHY 5410: Homework Week 11

18.2 Investigate the scattering from the δ-shell potential of Problem 17.2

$$v(r) = -\lambda \frac{\hbar^2}{2m} \delta(r-a) \quad ,$$

using the notation introduced there.

(**a**) Calculate the scattering phases $\delta_l(k)$.

(**b**) Give the scattering cross section for s-waves.

(**c**) Determine the condition for the maxima of the s-wave scattering cross section.

(**d**) From here on, assume $g \gg \pi$. Determine the maxima for $ka \ll g$.

18.4 Calculate the total cross section for s-wave scattering on a completely impenetrable sphere, i.e., for

$$v(r) = \begin{cases} \infty\,, & r < a \\ 0\,, & r > a \end{cases} \quad .$$

18.5 Calculate the phase shift δ_0 from s-wave scattering states for an attractive and for a repulsive square-well potential.