215a Homework exercises 4, due Nov. 7

Homework exercise key: "Luke problem $n.m$" refers to exercise set n, problem m. Likewise for Tong. Follow links from website.

1. Luke 4.1. Exercise about $d\sigma/d\Omega$ for $N + \bar{N} \to N + \bar{N}$ in our toy model of mesons and nucleons.

2. Luke 4.2. Exercise about $d\sigma/d\Omega$ for $N + \bar{N} \to \phi + \phi$ in the same theory.

3. Luke 4.5. Exercise about taking our meson + nucleon toy model, but now with $\mathcal{L}_{int} = -g\phi\psi\bar{\psi} - \rho(x)\phi$. The idea here is that $\rho(x)$ is an external source for a meson beam, that the experimenter can control and use to probe the nucleus. Here we have a double perturbation theory, in powers of g and $\rho(x)$. Give all answers to leading non-zero order in g and $\rho(x)$.