

P621 Problem Set 5

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(Dated: Due Nov. 9, 2006)

- 1) Problem 4.2 in text on p. 127.
- 2) Problem 4.4
- 3) One pion exchange potential. Consider two nucleons exchanging an uncharged pseudoscalar pion with interaction lagrangian

$$\mathcal{L} = -ig\bar{\psi}\gamma_5\psi\phi.$$

Calculate the effective potential to lowest order in the coupling constant g . Write your answer in momentum space. First show

$$\bar{U}(p')\gamma_5 U(p) = a\bar{U}(p')\gamma_5\gamma \cdot (p' - p)U(p)$$

and calculate the constant a . Next take the nonrelativistic limit of $\bar{U}\gamma_5\gamma \cdot qU$.