

University of California at Santa Barbara
Physics Department
Physics 225A Homework 7

• **Problem 1**

Halzen and Martin, Problem 6.8; hence show that if quarks had spin 0, $F_2(x)$ would still be given by H.M. equation (9.13), but $F_1(x) = 0$.

• **Problem 2**

Halzen and Martin, Problem 8.6.

• **Problem 3**

Halzen and Martin, Problem 8.11.

• **Problem 4**

Halzen and Martin, Problem 8.12.

• **Problem 5**

Halzen and Martin, Problem 8.13.

• **Problem 6**

Halzen and Martin, Problem 9.9.

• **Problem 7**

Show, by drawing the relevant lowest order Feynman diagram, that the Drell-Yan process $pp \rightarrow e^+e^- + X$ can give information on the quark-sea distribution function. Also, show in the same manner that the prompt-photon process, $p\bar{p} \rightarrow \gamma + X$ can give information on the gluon distribution function. Note that there is also a diagram, at the same order, where the gluon distribution function does not enter. (Draw it).

• **Problem 8**

Prove the Gottfried relation:

$$\int \frac{dx}{x} [F_2^{eP}(x) - F_2^{en}(x)] dx = \frac{1}{3}$$