1 Follow the same logic shown at the end of page 145 and obtain the external line Feynman rules for the three cases that were not done. ($\bar{u}^s$ & v^s)

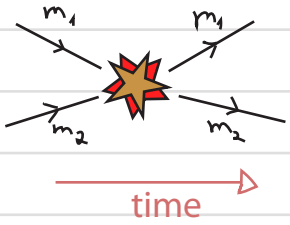
2 Do the exercise 3.6 of Peskin and Schroeder (Fierz Identities)

3 Consider the model (Minkowski metric):

$$\mathcal{L} = \bar{\psi}_1(i\gamma^\mu \partial_\mu - m_1)\psi_1 + \bar{\psi}_2(i\gamma^\mu \partial_\mu - m_2)\psi_2 + \frac{1}{2}\partial_\mu\phi\,\partial^\mu\phi - \frac{1}{2}m_\phi^2\phi^2 + g_1\bar{\psi}_1\psi_1\phi + g_2\bar{\psi}_2\psi_2\phi$$

(tip: spend a few minutes "reading" the physical content, figure out how many particles are there, what are their masses and how do they couple to each other. Draw all the Feynman Rules of the theory if that helps you).

a Calculate the matrix element $|\mathcal{M}|^2$ of the scattering between fermions ψ_1 and ψ_2 lowest possible perturbative order (the LO, or Leading Order, contribution):



b Considering the initial particles are not polarized and we are not measuring the final polarizations, calculate:

$$\frac{1}{\#}\sum\ldots\sum |\mathcal{M}|^2$$

appropriate sums and averages over spins

(write your answer as traces of products of Dirac Matrices).