Quantum Mechanics III, set 12.

Ex.1. Reproduce the method to generate the fermionic amplitudes, where the incoming and outgoing states have definite momenta and spins.

Ex.2. *(Repeated)* Assume that Dirac field with a mass m interacts with the quantum real scalar field with a mass M and the interaction has a form

$$\mathcal{H}_{int} = g\bar{\Psi}(x)\phi(x)\Psi(x), \quad H_{int} = \int d^3x \mathcal{H}_{int}.$$

Find all connected diagrams to order g^2. What are their signs as compared to similar diagrams from ex. 2. from Set. 11.

Ex.3. *(Repeated)* Find all two-body amplitudes for scattering processes (two incoming and two outgoing particles) for processes described by the diagrams from Ex. 2 and similar amplitudes for scalar case (Set 11).