663, Homework II, (1 extra problem)

Problem 3

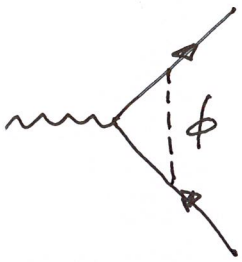
Assume that the value of $(g-2)/2$ is accounted by known corrections to precision of 10^{-10}. Consider now a scalar particle of mass M and compute the correction to $(g-2)/2$ from an interaction

a)
$$V = \int d^3x \frac{\lambda}{\sqrt{2}} \phi \bar{\psi} \psi \tag{0.1}$$

Since this correction is not seen, what constraints do you get on the values of M and λ? Repeat the same for a pseudo-scalar particle ϕ that couples as

b)
$$V = \int d^3x \frac{i\lambda}{\sqrt{2}} \phi \bar{\psi} \gamma^5 \psi \tag{0.2}$$

c) Consider now a fermion of mass M and charge e that modifies the $(g-2)/2$ by correcting the photon propagator as in the figure. Compute the corrections to g with particular attention ot the case $M \gg m$ where m is the mass of the electron.



a), b)