

Rutgers Physics 619 (Fields II) HW4

Instructor: David Shih

Due date: Monday, April 9, 2018

- 1) Srednicki 62.3
- 2) Srednicki 62.2
- 3) Srednicki 66.3
- 4) Srednicki 67.2
- 5) Consider extending QED with an extra neutral Dirac fermion Ψ (with mass M) and charged scalar ϕ (with mass m) and Yukawa interaction with the electron:

$$\delta L = \lambda \bar{\Psi} e \phi + c.c. \quad (1)$$

- a) Compute the contribution of Ψ and ϕ to the electron $g - 2$ at one-loop.
- b) Suppose for simplicity that $M = m$. Using the experimental and SM prediction for the electron $g - 2$, estimate a lower bound on the scale M .
- c) Repeat part (b) but for the muon. Which sets a stronger limit?