Helpful Hint for Assignment 2, last problem

Following the notation

$$\begin{aligned}\mathcal{L}_{\rm bare} &= \frac{(\partial\phi)^2}{2} - M^2\frac{\phi^2}{2} + \overline{\psi}(i\partial\!\!\!/ - m)\psi - iy\overline{\psi}\gamma^5\psi - \frac{\lambda}{4!}\phi^4 \\ &+ \delta Z_\phi\frac{(\partial\phi)^2}{2} - \delta M^2\frac{\phi^2}{2} + \overline{\psi}(\delta Z_\psi i\partial\!\!\!/ - \delta m)\psi - i\delta y\overline{\psi}\gamma^5\psi - \delta\lambda\frac{\phi^4}{4!} \qquad (1)\end{aligned}$$

the divergent part of the counter terms are given within dimensional regularization ($d = 4 - 2\epsilon$) by:

$$\delta Z_\phi \sim -\frac{y^2}{8\pi^2}\,\frac{1}{\epsilon} \qquad (2)$$

$$\delta M^2 \sim -\frac{y^2 m^2}{4\pi^2}\,\frac{1}{\epsilon} \qquad (3)$$

$$\delta Z_\psi \sim -\frac{y^2}{32\pi^2}\,\frac{1}{\epsilon} \qquad (4)$$

$$\delta m \sim -\frac{y^2 m}{16\pi^2}\,\frac{1}{\epsilon} \qquad (5)$$

$$\delta y \sim \frac{y^3}{16\pi^2}\,\frac{1}{\epsilon} \qquad (6)$$

$$\delta\lambda \sim \left(-\frac{3y^4}{2\pi^2} + \frac{3\lambda^2}{32\pi^2}\right)\,\frac{1}{\epsilon} \qquad (7)$$

in addition to the quadratically divergent additive shift to the scalar mass:

$$\delta M^2 = \frac{y^2\Lambda^2}{4\pi^2} \sim \frac{4\mu^2 y^2}{(4\pi)^{d/2}}\frac{2}{2-d} \quad \text{within DR} \qquad (8)$$