

$$\log(\mathcal{Z}) = \left(\begin{array}{cc} a^2(\mu_R) \frac{6}{\epsilon} & -a(\mu_R) g \frac{6}{\epsilon} \\ -\frac{a^2(\mu_R)}{g} \frac{6}{\epsilon} & a(\mu_R) \frac{6}{\epsilon} - a^2(\mu_R) \frac{18}{\epsilon} \end{array} \right) + \mathcal{O}\left(a(\mu_R)^3\right)$$