

$$\begin{aligned}
 R(\epsilon) &\equiv \frac{B_0(\epsilon)}{B_{-1}(\epsilon)} - 1 = \frac{\Gamma^3(1-\epsilon)\Gamma(1+\epsilon)}{\Gamma(1-2\epsilon)} - 1 \\
 &= -2\zeta_3\epsilon^3 - 3\zeta_4\epsilon^4 - 6\zeta_5\epsilon^5 - (10\zeta_6 - 2\zeta_3^2)\epsilon^6 + \mathcal{O}(\epsilon^7).
 \end{aligned}$$