One-loop Scalar Integral I_S (series in ϵ)

$$-\frac{M_2^2}{16\pi^2\epsilon}+\frac{\gamma M_2^2}{32\pi^2}-\frac{M_2^2}{32\pi^2}-\frac{M_2^2\log\left(\frac{4\pi\mu_2}{M_2}\right)}{32\pi^2}+O\left(\epsilon^2\right)$$

One-loop Effective Potential ΔV (series in ϵ)

$$-\frac{M_2^2}{32\pi^2\epsilon}+\frac{\gamma M_2^2}{64\pi^2}-\frac{M_2^2}{64\pi^2}-\frac{M_2^2\log\left(\frac{4\pi\mu_2}{M_2}\right)}{64\pi^2}+O\left(\epsilon^2\right)$$

Double-Bubble Diagram (two-loop, series in ϵ)

$$\frac{M_2^4}{256\pi^4\epsilon^2}+\frac{M_2^4\left(4\log\left(\frac{4\pi\mu_2}{M_2}\right)-4\gamma+4\right)}{1024\pi^4\epsilon}+\frac{M_2^4\left(\frac{\log\left(\frac{4\pi\mu_2}{M_2}\right)}{2}-\frac{\gamma}{2}+\frac{1}{2}\right)^2}{256\pi^4}+O\left(\epsilon^2\right)$$

Sunset Diagram (two-loop, series in ϵ)

$$\epsilon\left(-\frac{M_2\log\left(M_2\right)^2}{1024\pi^4}-\frac{\gamma M_2\log\left(M_2\right)}{512\pi^4}+\frac{M_2\log\left(M_2\right)}{512\pi^4}+\frac{M_2\log\left(\pi\right)\log\left(M_2\right)}{512\pi^4}+\frac{M_2\log\left(2\right)\log\left(M_2\right)}{256\pi^4}-\frac{M_2\log\left(2\right.}{256}\right.$$

Basketball Diagram (three-loop, series in ϵ)

$$\epsilon\left(\frac{M_2^2\log\left(M_2\right)^2}{131072\pi^6}-\frac{3M_2^2\log\left(M_2\right)}{131072\pi^6}-\frac{M_2^2\log\left(2\right)\log\left(M_2\right)}{32768\pi^6}-\frac{M_2^2\log\left(\pi\right)\log\left(M_2\right)}{65536\pi^6}+\frac{\gamma M_2^2\log\left(M_2\right)}{65536\pi^6}-\frac{3\gamma M_2^2}{131072\pi}\right.$$

Beta Function Structure Summary

$$\beta(\lambda)=\cdots-c_1\lambda^2+c_2\lambda^3-c_3\lambda^4$$