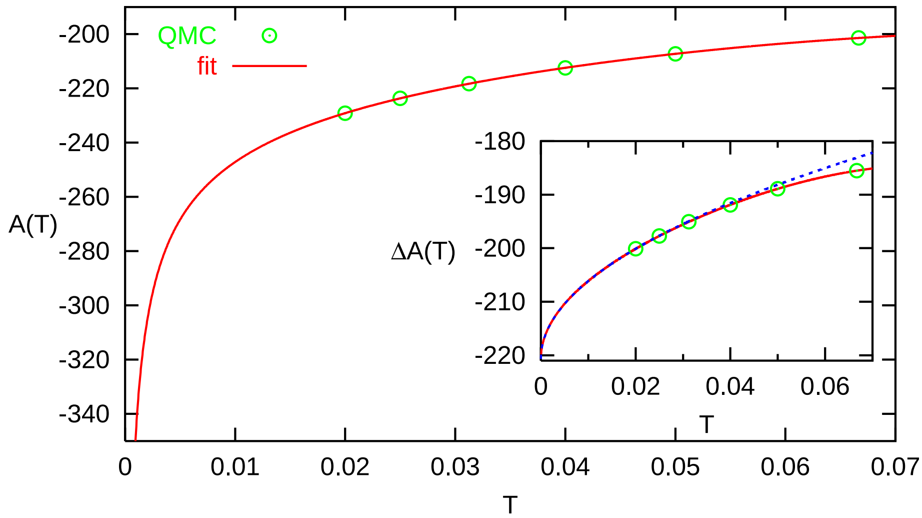

Figure 3.49: QMC results and fit for T-dependence of $A(T)$, used in the linearized differential equation for $U_c(T)$ (see text). The correction to the asymptotic low-temperature result $A(T) \sim 4.1/\sqrt{T}$ is shown in the inset. Here, the additional short-dashed line indicates the correction without T^4 term, i.e., the sum of the constant and the square-root term.

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approximation $f(T, U) = A(T) + 43\,U$ is reasonably accurate, and determined the asymptotic low-temperature behavior for $A(T)$. The remaining task is finding an accurate interpolating fit form for $A(T)$ which can then be solved with the suitable boundary condition. Using the observation that $A(T) = \sqrt{\ln 2/(2a)}\,T^{-1/2} + \mathcal{O}(T^0)$ it might seem most natural to successively include higher and higher orders of $T^{1/2}$ in a parameterization of $A(T)$ until it matches the QMC data for the whole coexistence region. It is, however, not clear that few orders suffice for a description up to the critical end point where a perturbation series might even break down. On the other hand, we only need a smooth *inter*polation of QMC data at high temperatures; an potentially unstable *extra*polation is only needed below the lowest QMC data point at $T = 0.02$. Specifically, we have chosen the parameterization

$$A(T) = -4.1T^{-1/2} + A_1 + (A_2 T)^{1/2} + (A_3 T)^4 \tag{3.49}$$

with

$$A_1 = -220.68\,, \qquad A_2 = 21170\,, \qquad A_3 = 18.7\,, \tag{3.50}$$

i.e., introduced the new parameters A_1 and A_2 for the two subleading terms in a systematic expansion plus a single term of much higher order parameterized by A_3. This fit is shown as solid line in Fig. 3.49. Evidently, it matches the QMC data (circles) quite accurately. In the inset, the asymptotic square-root singularity has been subtracted from $A(T)$. Even at this scale no deviations of the full fit (solid line) from the QMC data is visible. In contrast, a fit including only terms up to order $T^{1/2}$ (i.e., with $A_3 = 0$) can only reproduce the low-temperature data (dashed line).