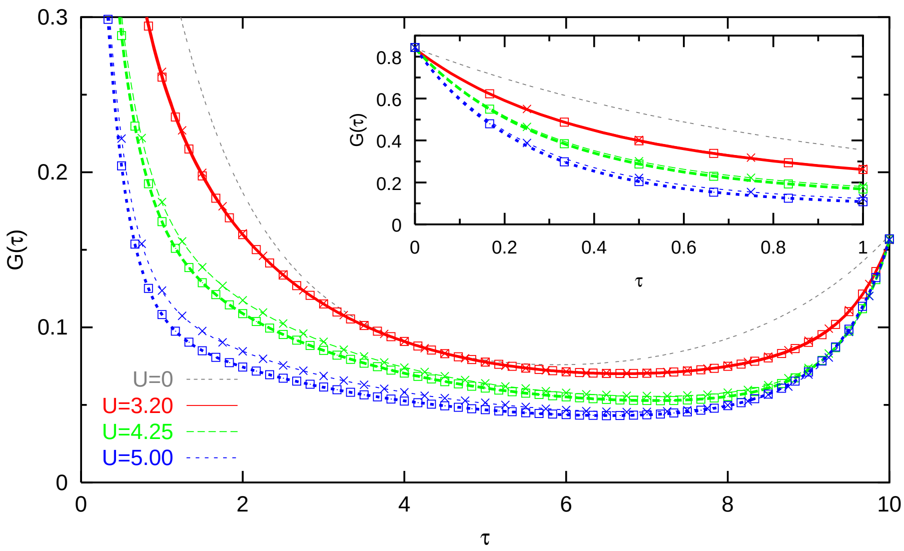

Figure 5.9: Imaginary time Green function $G(\tau)$ for $\Delta\tau = 0.25$ (crosses) or $\Delta\tau = 0.167$ (squares). The lines connecting the data points correspond via (1.55) to the spectra shown in Fig. 5.5 and Fig. 5.12, respectively. The curve "$U = 0$" shows the bare LDA estimate for $G(\tau)$ for comparison.

In Fig. 5.9 we compare the imaginary-time Green function $G(\tau)$ as previously calculated for $\Delta\tau = 0.25$ with the result of new measurements for $\Delta\tau = 0.167$, i.e., with the number of time slices increased from 40 to 60. This step requires a 3-4 fold increase of computer time and should eliminate roughly between a third (for a linear extrapolation law in $\Delta\tau$) and half (for a quadratic extrapolation law) of the original systematic error. For "weak" interaction, i.e., for $U = 3.2$ of the order of the bandwidth, differences upon reducing the discretization error are hardly detectable on the scale of the figure (while being significant at least for $1 \lesssim \tau \lesssim 2$). In contrast, the improved accuracy clearly changes the results for $U = 4.25$ and, particularly, $U = 5$. It is important to realize that statistical errors are of the order of the linewidths (of the thin lines) and that the full systematic errors are expected to equal 2 or 3 times the observed differences. Thus, systematic errors exceed statistical errors by more than an order of magnitude which fully explains all the problems encountered with maximum entropy analytic continuation described above.[21] The solid lines connecting the $\Delta\tau = 0.25$ data points shown in Fig. 5.9 have been obtained by applying (1.55) to the spectra shown in Fig. 5.5; practically indistinguishable curves were obtained, however, by also using "backward" analytic continuation (1.55) for spectra obtained in variations of the maximum entropy method. Physically, the reduced values for $G(\tau)$ at $\tau \approx \beta/2$ point towards decreasing spectral weight near the Fermi energy, i.e.,

[21] We note that the statistical error of the self-energy effectively gives rise to a systematic error for the measurements of $G(\tau)$ since the self-energy defining the bath green function was kept fixed for all measurements. This error also exceeds the statistical error calculated in the measurements but is (for $U = 4.25$ or $U = 5.0$) well below the $\Delta\tau$ error.