

Problems 2 Many Body Physics (Due on Thursday October 12 th)

We are going to use the mathematica program which we constructed last week to practice the evaluation of several many body observables.

So take the one dimensional Hubbard model with 4 sites and periodic boundary conditions, at half filling (2 up particles and 2 down particles).

Let us evaluate the following quantities for $t=1$, and $U=, 4$ and 8 and plot them vs U .

a) kinetic energy per site b) interaction energy per site c) $\frac{1}{N_s} \sum_i < S_i \cdot S_{i+1} >$, average spin exchange energy.

Can you explain qualitatively the trends you see in your results?