# Table of results

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## 1 Results

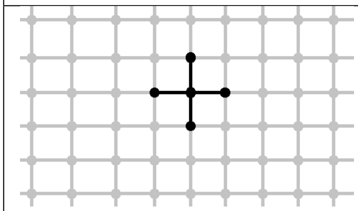
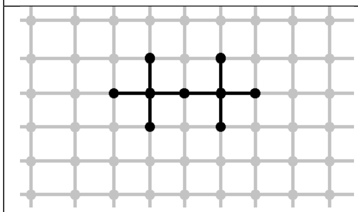
$$H = J \sum_{<i,j>} (\boldsymbol{\sigma}_i \boldsymbol{\sigma}_j) = 2J \sum_{<i,j>} (\boldsymbol{s}_i \boldsymbol{s}_j)$$

$$E_{gs\ full}/N \geqslant$$

### 1.1 1d case

| cluster | Shredinger | Variational |
|---|---|---|
|  | -2.1547 | -2.09548 |
|  | -1.92789 | -1.91063 |
|  | -1.99486 | -1.94983 |
|  | -1.89083 | -1.87265 |
|  | -1.92853 | -1.8388 |

### 1.2 2d case

| cluster | Shredinger | Variational |
|---|---|---|
|  | -3 | -3 |
|  | -2,9685 | -2.9657 |

## 2 Basis overflow hypotesis

All linear dependencies in basis (because of which basis is overcrowded) are derived from equation (1) and (3). But $(1,2) \Rightarrow$ (3). It was checked up to 10 spins.

$$+(\boldsymbol{\sigma}_1\boldsymbol{\sigma}_2)(\boldsymbol{\sigma}_3\boldsymbol{\sigma}_4\boldsymbol{\sigma}_5) - (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_3)(\boldsymbol{\sigma}_2\boldsymbol{\sigma}_4\boldsymbol{\sigma}_5) + (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_4)(\boldsymbol{\sigma}_2\boldsymbol{\sigma}_3\boldsymbol{\sigma}_5) - (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_5)(\boldsymbol{\sigma}_2\boldsymbol{\sigma}_3\boldsymbol{\sigma}_4) = 0 \tag{1}$$

$$(\boldsymbol{\sigma}_1\boldsymbol{\sigma}_2\boldsymbol{\sigma}_3)(\boldsymbol{\sigma}_4\boldsymbol{\sigma}_5\boldsymbol{\sigma}_6) = \det\begin{pmatrix}(\boldsymbol{\sigma}_1\boldsymbol{\sigma}_4) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_4) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_4)\\ (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_5) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_5) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_5)\\ (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_6) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_6) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_6)\end{pmatrix} \tag{2}$$

$$(1,2) \;\Rightarrow\quad \det\begin{pmatrix}(\boldsymbol{\sigma}_1\boldsymbol{\sigma}_5) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_5) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_5) & (\boldsymbol{\sigma}_4\boldsymbol{\sigma}_5)\\ (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_6) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_6) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_6) & (\boldsymbol{\sigma}_4\boldsymbol{\sigma}_6)\\ (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_7) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_7) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_7) & (\boldsymbol{\sigma}_4\boldsymbol{\sigma}_7)\\ (\boldsymbol{\sigma}_1\boldsymbol{\sigma}_8) & (\boldsymbol{\sigma}_2\boldsymbol{\sigma}_8) & (\boldsymbol{\sigma}_3\boldsymbol{\sigma}_8) & (\boldsymbol{\sigma}_4\boldsymbol{\sigma}_8)\end{pmatrix} = 0 \tag{3}$$

$$+(\sigma_1\sigma_2)(\sigma_3\sigma_4\sigma_5) - (\sigma_1\sigma_3)(\sigma_2\sigma_4\sigma_5) + (\sigma_1\sigma_4)(\sigma_2\sigma_3\sigma_5) - (\sigma_1\sigma_5)(\sigma_2\sigma_3\sigma_4) = 0 \qquad (1)$$

$$(\sigma_1\sigma_2\sigma_3)(\sigma_4\sigma_5\sigma_6) = \det\begin{pmatrix}(\sigma_1\sigma_4) & (\sigma_2\sigma_4) & (\sigma_3\sigma_4)\\ (\sigma_1\sigma_5) & (\sigma_2\sigma_5) & (\sigma_3\sigma_5)\\ (\sigma_1\sigma_6) & (\sigma_2\sigma_6) & (\sigma_3\sigma_6)\end{pmatrix} \qquad (2)$$

$$(1,2) \Rightarrow \quad \det\begin{pmatrix}(\sigma_1\sigma_5) & (\sigma_2\sigma_5) & (\sigma_3\sigma_5) & (\sigma_4\sigma_5)\\ (\sigma_1\sigma_6) & (\sigma_2\sigma_6) & (\sigma_3\sigma_6) & (\sigma_4\sigma_6)\\ (\sigma_1\sigma_7) & (\sigma_2\sigma_7) & (\sigma_3\sigma_7) & (\sigma_4\sigma_7)\\ (\sigma_1\sigma_8) & (\sigma_2\sigma_8) & (\sigma_3\sigma_8) & (\sigma_4\sigma_8)\end{pmatrix} = 0$$