Project #1

1번 :

$$a_1 = \frac{1}{2}(1-4f^2)^{1/4}$$

$$a_2 = \frac{1}{4}\ln\left(\frac{1+2f}{1-2f}\right)$$

$$a_3 = -\frac{1}{4}\ln(1-4f^2)$$

2번 : 문제에 주어진 f에서는 $\sigma_I \sigma_I'$ 항이 상쇄되어 σ_I', σ_{I+1}의 합들을 독립적으로 할 수 있다.

$$e^{\bar{K}'[\mu]} = a_1^{N/2} \prod_I \{ \exp[K+2h+a_2(\mu_I+\mu_{I+1})] + \exp[K-2h-a_2(\mu_I+\mu_{I+1})] + \exp[-K+a_2(\mu_I-\mu_{I+1})] + \exp[-K-a_2(\mu_I-\mu_{I+1})] \}$$

3번 :

$$x' = \frac{x(1+y)^4}{(1+y^2+2xy)^2 - (1-x)(1-y^2)^2} \qquad y' = \frac{1+y^2+2xy-(1-y^2)\sqrt{1-x}}{1+y^2+2xy+(1-y^2)\sqrt{1-x}}$$

4번 : fixed points

$x^*=0,\ y^*=0\ (T=0,\ H=\infty)$

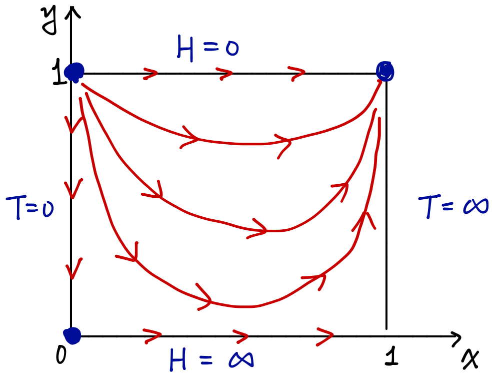
$x^*=0,\ y^*=1\ (T=0,\ H=0)$

$x^*=1,\ y^*=1\ (T=\infty,\ H=0)$

$x^*=0,\ y^*=1\ (T=0,\ H=0)$ (ferromagnetic FP)

$x' \simeq 4x,\quad y'-1 = 2(y-1)$ (decimation 방법과 동일.

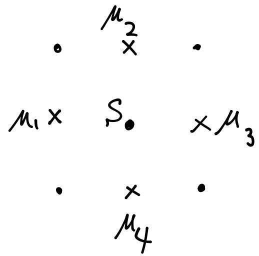
5번



Project #2

1번 :

$$e^{\bar{K}'[\mu]} = \sum_{\{S_i\}} P(\{S_i\},\{\mu_i\})\, e^{\bar{K}[S]}$$



try $\bar{K}[\mu] = K' \sum_{\langle i,j \rangle} \mu_i \mu_j$

$$\sum_S e^{KS(\mu_1+\mu_2+\mu_3+\mu_4)} = 2\cosh(K(\mu_1+\mu_2+\mu_3+\mu_4))$$

$$= A e^{\frac{K'}{2}(\mu_1\mu_2+\mu_2\mu_3+\mu_3\mu_4+\mu_4\mu_1)}$$ (double counting 고려)

all $\mu_1=\mu_2=\mu_3=\mu_4=+1$: $2\cosh(4K) = Ae^{2K}$

$\mu_1=\mu_2=\mu_3=-\mu_4=1$ $\quad 2\cosh(2K) = A$

$\mu_1=\mu_2=-\mu_3=-\mu_4=1$ $\quad 1 = A$

] not consistent

$\therefore$ $\bar{K}'[\mu] = K' \sum_{\langle i,j \rangle} \mu_i \mu_j$ 만으로는 정확한 RGT 불가능

2번 : $K_1 = \frac{1}{4}\ln\cosh(4K)$, $\quad K_2 = \frac{1}{8}\ln\cosh(4K)$ $\quad K_3 = \frac{1}{8}\ln(\cosh(4K)) - \frac{1}{2}\ln\cosh(2K)$

3번 : $K' = K_1 + K_2 = \frac{3}{8}\ln[\cosh(4K)]$

4번 : $K^* = \infty,\ 0,\ 0.5070 \equiv K_c$ $\quad$ (exact value : $K_c = \frac{1}{2}\ln(\sqrt{2}+1) \simeq 0.441$)

$\nu = 1/y_t \simeq 0.934$ $\quad$ (exact : $\nu = 1$)