$$L = \frac{\partial}{\partial q} \left( \frac{q^2}{2} - V(q) \right) + \frac{\partial}{\partial \theta} \left( \frac{\theta^2}{2} \right)$$

Solving also \( \theta = 0 \).

$$\frac{\partial}{\partial \theta} \left( \frac{\theta^2}{2} \right) = 0 \implies \theta = 0$$

\[ C = \frac{V}{C} \implies \frac{h^2}{g} = \frac{V}{C} \]

General way to solve in the quadratic there:

\[ \frac{h^2}{g} = \frac{V}{C} \]

An easier way to note the point at the critical point, \( \frac{h^2}{g} \).

Below critical point:

\[ \frac{\partial}{\partial q} \left( \frac{q^2}{2} - V(q) \right) = 0 \]

Above critical point:

\[ \frac{\partial}{\partial q} \left( \frac{q^2}{2} - V(q) \right) > 0 \]

Calculate again to get the answer, but this is kind of again only one root. Therefore we could find the roots of this below the critical point. The less 3 roots, above it, there is.

\[ \frac{\partial}{\partial q} \left( \frac{q^2}{2} - V(q) \right) < 0 \]

But ahead we know that \( \frac{\partial}{\partial \theta} \left( \frac{\theta^2}{2} \right) = 0 \).

Above critical point:

\[ \frac{\partial}{\partial \theta} \left( \frac{\theta^2}{2} \right) > 0 \]

Below critical point:

\[ \frac{\partial}{\partial \theta} \left( \frac{\theta^2}{2} \right) < 0 \]

(1) Gibbs free energy below critical point:

**SCW Solutions**

PS2 Solutions
\[ L = \frac{d}{\theta} \left( \sqrt{y^2 - \frac{\theta}{b}} \right) - \frac{g}{1} \left( \frac{L}{T} \right) \]

\[ S = \frac{d}{\theta} \left( \sqrt{y^2 - \frac{\theta}{b}} \right) \]

\[ \text{Solving the equation with the condition that} \quad \theta = \frac{g}{1} \]

\[ P = \frac{1}{\theta} \left[ \left( \frac{\theta}{\sqrt{y^2 - \frac{\theta}{b}}} \right) + \frac{a - \theta}{q - \frac{\theta}{1}} \left( \frac{\theta}{\sqrt{y^2 - \frac{\theta}{b}}} \right) \right] \]

\[ \frac{V}{1} P \left( \frac{d}{\theta} \right) \text{ such that} \quad V = 0.13, \quad V = 0.17, \quad V = 0.19 \]

\[ P \left( \frac{d}{\theta} \right) = 0 \]

Also, \( P = 0 \)

\[ \sum P \left( \frac{d}{\theta} \right) = 0 \]

The maximum condition is when \( \theta = 0.5 \) and \( P = 0.5 \).
\[
\text{From this, } \langle \nu_1 | \langle \nu_2 | 0 \rangle = e^{-\frac{y_e}{Z}} \quad \text{and } \quad 0 < \nu_1, \nu_2 < 1.
\]

If \( E = 0 \) by symmetry (remember no spontaneous breaking in (a))

Assume \( E = 0 \). By symmetry this gives the answer

\[
\langle \nu_1 | \langle \nu_2 | 0 \rangle = e^{-\frac{y_e}{Z}}
\]

Now

\[
\sum_{\nu_2} \langle \nu_2 | \langle \nu_1 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}}
\]

\[
\sum_{\nu_1} \langle \nu_1 | \langle \nu_2 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}} \quad (2)
\]

Finally:

\[
\langle \nu_1 | \langle \nu_2 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}} \quad (3)
\]

\[
\text{which is the same as the answer given in the problem statement.}
\]

\[
H = \sum_{\nu_2} \langle \nu_2 | \langle \nu_1 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}}
\]

The above can only come from the last term. Now flip all phases. The final fit will still only the first spin.

\[
\langle \nu_1 | \langle \nu_2 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}} \quad (4)
\]

\[
\langle \nu_1 | \langle \nu_2 | 0 \rangle = \frac{y_e}{Z} e^{-\frac{y_e}{Z}} \quad (5)
\]
In the thermodynamic limit, no matter what is we start with the result is the same. So, just multiply the whole thing by \( L \) and take \( \lambda = 0 \).

\[
X = \frac{1}{T} \sum_{J=0}^\infty e^{-\frac{J}{kT}} = \frac{1}{T} \left( 1 + 2 \sum_{J=1}^\infty e^{-\frac{J}{kT}} \right) = \frac{1}{T} \left( 1 + 2 e^{-\frac{1}{kT}} \sum_{J=1}^\infty e^{-\frac{J}{kT}} \right)
\]

\[
X = \frac{1}{T} \left( 1 + \frac{2 e^{-\frac{1}{kT}}}{1 - e^{-\frac{1}{kT}}} \right)
\]

\[\text{(4a) The trick here is to use bond variables.}\]

Define \( \sigma_i \) for spins on the backbone, \( \sigma_i^+ \) for above the backbone, \( \sigma_i^- \) below it.

Now define \( \eta_i^+ = \sigma_i^+ \sigma_i \), \( \eta_i^- = \sigma_i^- \sigma_i \), \( \eta_i^0 = \sigma_i \sigma_i \), \( \eta_{i+1}^0 = \sigma_{i+1} \sigma_i \), \( \eta_{i-1}^0 = \sigma_i \sigma_{i-1} \), \( \eta_{i+1}^+ = \sigma_i \sigma_{i+1} \), \( \eta_{i-1}^+ = \sigma_{i-1} \sigma_i \), \( \eta_{i+1}^- = \sigma_i \sigma_{i-1} \), \( \eta_{i-1}^- = \sigma_{i-1} \sigma_i \).

\[
Z = \sum_{\sigma_0} \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i+1}^0 \right] \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i-1}^0 \right] \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i+1}^+ \right] \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i-1}^+ \right] \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i+1}^- \right] \exp \left[ \beta J \sum_{i=1}^{L-1} \eta_{i-1}^- \right]
\]

\[
Z = \left[ 2 \cosh (\beta J) \right]^{L-1} \left[ 2 \cosh (\beta J) \right]^{2(L-1)} = \left[ 2 \cosh (\beta J) \right]^{2L-2}
\]
If one is on the background, the path is one long journey.

\[ (C \cup D) \!
\]

But both are on the background, the path is one long journey.

\[ (C \cup D) \!
\]

Thus, we get \((\forall x)(P(x))\) by (L1).

Also, if both are same, we get \((\forall x)(\forall y)(\forall z)(P(x) \land P(y) \land P(z))\) by (L2).

Every time an event appears in the partition, it brings a cash to a

two kind weath max, where "path" is a path connecting the

calculating correlator, equals mean nothing flat

\[
\begin{align*}
\frac{1}{C} & = \frac{1}{(3L-2)^2} \times \frac{1}{(C \cup E)} \times \frac{1}{(D \cup E)} \\
\frac{1}{C} & = \frac{1}{(3L-2)^2} \times \frac{1}{(C \cup E)} \times \frac{1}{(D \cup E)} \\
\end{align*}
\]
\( \frac{1}{N} \left( \sum_{t=0}^{\infty} \frac{1}{\mathcal{Z}_t} \right) = \frac{1}{N} \left( \sum_{t=0}^{\infty} \frac{1}{\mathcal{Z}_t} \right) = \frac{1}{N} \left( \sum_{t=0}^{\infty} \frac{1}{\mathcal{Z}_t} \right) \)

Once again, we take the thermal average and adjust for the block size. Let \( \{ O_t \} \), be the set of non-\( c \) operators. Then we have:

\( \chi = \frac{1}{N} \sum_{t=0}^{\infty} \mathcal{Z}_t \)

1. This is again a 10 system, so \( \langle \sigma_z \rangle = 0 \) because \( \langle \sigma_z \rangle = 0 \).