# Universality holds for second order phase transitions not for first order...

Let's consider the mean field solution of the Ising model.
The Landau function for homogeneous magnetization reads

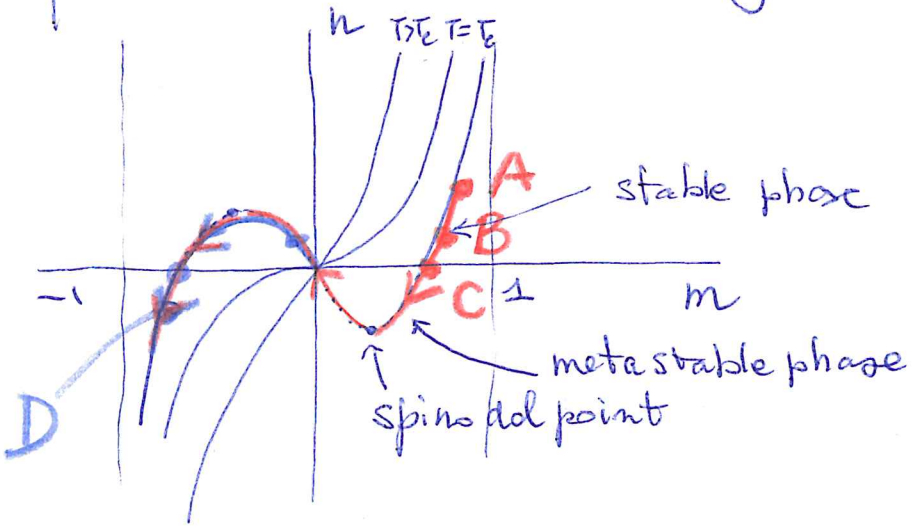
$$\Psi(m) = N\left[\frac{1}{2}Jzm^2 - \frac{1}{\beta}\ln 2\cosh[\beta(Jzm+h)]\right]$$

The Curie-Weiss self-consistency is

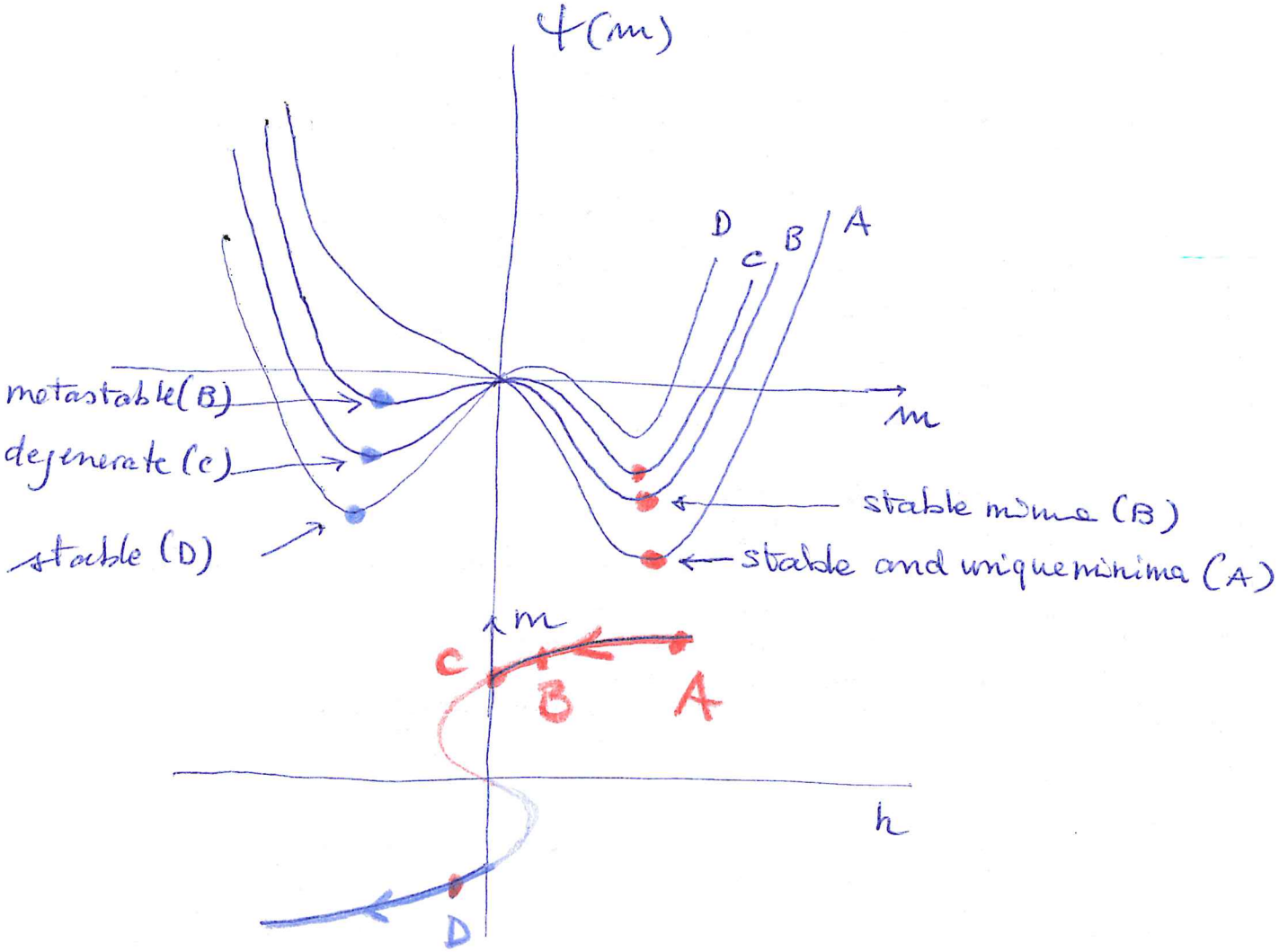
$$m = \tanh[\beta(Jzm+h)]$$

which once inverted gives

$$h = \frac{1}{\beta}\tanh^{-1}(m) - Jzm \qquad \tanh^{-1}(m) = \frac{1}{2}\ln\left(\frac{1+m}{1-m}\right)$$



The first order phase transition as in this case characterized by the behaviour of the $\psi$




The behaviour of the order parameter is dictated by $\psi(m)$ in the large $|m|$ region
therefore an expansion of $\psi$ around $m \simeq 0$ which is universal (the terms of the expansion depends only on symmetries of H) is no longer applicable in the description of first order p.t.
to describe the first order p.t. we need the full $\psi(m)$