

## Problem 13

a) correlation length  $\xi$ ; system size  $L$   
 $\frac{L}{\xi} \propto L |T - T_c|^\nu \Rightarrow \xi \propto |T - T_c|^{-\nu}$

$T = T_c$ :  $\xi \rightarrow \infty$  as expected

$T \rightarrow \infty$ :  $\xi \rightarrow 0$  as expected

$T \rightarrow 0$ :  $\xi$  is finite  $\xi \propto |T_c|^{-\nu}$  as expected

b)  $f(r) \propto r^\beta$ ,  $T < T_c$ ,  $r = L^{\frac{1}{\nu}} (T - T_c)$ ,  $q = -\frac{\beta}{\nu}$ ,

$$\langle m \rangle = L^q f(r)$$

for  $T < T_c \rightarrow \xi \ll L \rightarrow \xi$  can be neglected

$$\Rightarrow f(r) \propto r^\beta \text{ in } \langle m \rangle$$

$$\langle m \rangle \propto L^q r^\beta = L^q L^{-q} (T - T_c)^\beta = (T - T_c)^\beta$$

$\Rightarrow \langle m \rangle \propto (T - T_c)^\beta \Rightarrow$  magnetisation is not only dependent of  $L$ , also if we have a finite system