$_order_parameter(recallthat$
$\sim$
ϕ
$B \sim$
$\frac{1}{U}$
$B =$
0
$_effective_potential_different_cases_j.Atbothminimahaveequal\bar{U}$
$T =$
$_potential_g1_above_below_critical_temperature.$
$j =$
0
$B =$
0

$$U = \mu^2(T)\rho+12\lambda\rho^2\,. \tag{1}$$

$\mu^2(T)$
$\mu^2() =$
0
T

$$\mu^2 = a\,(T-)+\,, \tag{2}$$

a
ρ_0
ϕ_0
$\rho_0(T) =$
$-\frac{\mu^2(T)}{\lambda} =$
$\frac{a\,(-T)}{\lambda}\,,$
$\phi_0(T) =$
$\sqrt{2\rho_0(T)} =$
$c\,\sqrt{-T}\,,$
$c =$
$\sqrt{\frac{2a}{\lambda}}$
$_diagram_landau_theory.$
ϕ_0

$$\phi_0 \sim (-T)^\beta\,, \tag{3}$$

β
$\beta =$
$\frac{1}{2}$
ϕ_0
T

$$[\phi_0]T \sim \frac{1}{\sqrt{-T}}\,. \tag{4}$$

$T \to$
$j \neq$
0

$$U = 12\lambda\rho^2\,, \tag{5}$$

$$\bar{U} = 18\lambda\,(\phi_a\phi_a)^2-j_a\phi_a\,. \tag{6}$$

$\phi_0(j)$
$j_a =$
$j\ _{a1}$
$\phi_{0,a} =$
$\phi_0\ _{a1}$

$$j = [U]\phi_1 = \frac{\lambda}{2}\phi_0^3\,, \tag{7}$$

$$\phi_0 \sim j^{13}\,, M \sim B^{13}\,. \tag{8}$$

M

$$M \sim B^{1\delta}\,, \tag{9}$$

δ
$\delta =$
3
M
B

$$[M]\beta \sim B^{-23}\,, \tag{10}$$

$B \to$
0
U
$T =$
??
??
$\mu^2 <$
0
$\mu^2 =$
0
$\mu^2 >$
0

0 :
3.97]plot[samples =
500](, 2 * exp(−10^2 * (−2)^2)); (3.5, 2)node; [− >
](0, −4)−
−(0, −1)node[above]; [− >
](−4, −4)−
−(4, −4)node[right]ϕ
2 *
(+2)^2)); [verythick, linecap =
round, smooth, domain =
0 :
3.97]plot[samples =
500](, −4 + exp(−10^2 * (−2)^2)); (3.5, −2)node;
$T <$
$T >$

$$p = \frac{NT}{V - b_0 N} - b_1 \left(\frac{N}{V}\right)^2 , \tag{12}$$

b_0
b_1
F

$$[F]V = -p\,, \tag{13}$$

$$F = TN\left[\ln\frac{N}{V - b_0 N} - 1 - \frac{3}{2}\ln\frac{mT}{2\pi\hbar^2}\right] - b_1\frac{N^2}{V}\,. \tag{14}$$

$v =$
$\frac{V}{N} =$
$\frac{1}{n}$

$$\tilde{f} = \frac{F}{N}\,, \tag{15}$$

$$[\tilde{f}]v = -p\,, \tag{16}$$

$$\tilde{g}(v, T, p) = \tilde{f}(v, T) + pv\,. \tag{17}$$

$\tilde{g}$
U
$w(v)$
$\tilde{g}(v)$

$$[\tilde{g}]v\Big|_{T,p} = 0. \tag{18}$$

$_system_v s_r eal_g$ aswehavelistedthecorrespondingquantitiesofmagneticsystemsandrealgases.Butnotethatthereisoneimpo
thereisno−symmetryfortherealgas.

ϕ	v
j	$-p$
U	$\tilde{f}$
$\bar{U}$	$\tilde{g}$

$\tilde{g}(v)$
T
p
$\tilde{g}(v)$
v
v

$$\tilde{g}(v) = \tilde{g}_0(T) + \tilde{g}_1(v, T, p)\,, \tag{19}$$

$=$
$\hbar =$
1

$$\tilde{g}_1 = -T\ln(v - b_0) - \frac{b_1}{v} + pv\,, \tag{20}$$

$$0 = [\tilde{g}_1]v = -\frac{T}{v - b_0} + \frac{b_1}{v^2} + p\,. \tag{21}$$

T
p
$_potential_g 1_a bove_b elow_c ritical_t emperature.Forbothlocalminimahaveequal\tilde{g}_1$
$T =$
$_density_l iquid_g as_t ransition.$
$T <$
$\tilde{g}_1$
v
$T >$
$\tilde{g}_1$
v
$\tilde{g}_1$
p
T
κ_T

$$\frac{1}{} = -V[p]V\Big|\quad .$$