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***Physics 404*** **HOMEWORK ASSIGNMENT #10** **Spring 2009**

**Due date:** Tuesday, May 5 **Deadline:** Thursday, May 7

B means a problem in Blundell & Blundell's text; GT means a problem in Gould & Tobochnik.

1. B24.3

2. B26.1 Note that this problem implicitly assumes that one is moving away from the critical point in the temperature "direction." Explicitly, you should assume that the volume is $V_C$.

3. B26.6 The first part is essentially the same as 26.5. Hint: For the last line, use eq. (11.26) and the reciprocity theorem. The full result is

$$C_p - C_V = \frac{R}{1 - \dfrac{2a(V-b)^2}{RTV^3}}$$

To get the result in the problem, you must assume V ≫ b and VTR ≫ a. What is the physical meaning of each of these assumptions? Is each reasonable?

4. B28.3 Hints:
   a) Use the Clausius-Clapeyron equation.
   b) Find the [conductive] heat flow (in $W/m^2$) from κ (ΔT/Δz); take a look at Eq. (9.14) if you want more background
   c) "Eventually" implies steady state, so that the heat flow through a fractional thickness *x* meters of ice is the same as through (1-*x*) meters of water. The fractional thickness *x* of the ice turns out to be a considerable rather than a small fraction.

Take a close look at problems 25.2 and 25.3 (ignoring the spin degeneracy *g*). Note that Eq. 25.31 does not depend on whether the energy varies linearly or quadratically with |**k**|; that issue comes into play in Eq. 25.33. Note in particular that $g(k) \propto k^{D-1}$. and then in Eq. 25.34 that $g(E) \propto E^{(D/S)-1}$, where *s* = 1 or 2 are the common cases.