Department of Physics
The Ohio State University

Prof. R. Bundschuh

First Problem Set for Physics 846 (Statistical Physics I)

Fall quarter 2003

Important dates: Sep 25 no class, Oct 30 10:30am-12:18pm midterm exam,
Nov 11 no class, Nov 27 no class, Dec 11 9:30am-11:18am final exam

Due date: Thursday, Oct 2, during class

1. Definitions

9 points

a) Explain the advantages and disadvantages of a thermodynamics approach versus a statistical physics approach.

b) Explain the difference between extensive and intensive state variables. Give at least three examples each.

c) Explain what an equation of state is and where equations of state come from.

2. Exact differentials

10 points

Consider the two differentials (1) $\mathrm{d}u_1 = (2xy+x^2)\mathrm{d}x+x^2\mathrm{d}y$ and (2) $\mathrm{d}u_2 = y(x-2y)\mathrm{d}x-x^2\mathrm{d}y$.

a) For both differentials, find the change in $u(x,y)$ between two points, (a,b) and (x,y). Compute the change in two different ways: (i) Integrate along the path $(a,b) \rightarrow (x,b) \longrightarrow (x,y)$, and (ii) integrate along the path $(a,b) \rightarrow (a,y) \rightarrow (x,y)$.

b) Which of the two differentials could be exact?

c) Show the exactness by taking derivatives.