In the name of God

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ADVANCED TOPICS IN STATISTICAL PHYSICS II

Exercise Set 5

(Date Due: 1396/03/01)

1. Problems 1, 3,10, 18,19 of chapter 10 Pathria.

2. For a sample containing hard spheres, the interacting pair potential is given by

$$u(r) = 0 \quad \text{if} \quad r > D$$

$$u(r) = \infty \quad \text{if} \quad r \leq D$$

using $P = nkT\left(1 - \frac{n}{2dkT}\int \frac{du}{dr} r g(r) d^d r\right)$, show that:
for $d = 1$ dimension we have

$$P = nkT(1 + nDg(D))$$

for $d = 2$ dimension we have

$$P = nkT\left(1 + \frac{\pi}{2} nD^2 g(D)\right)$$

for $d = 3$ dimension we have

$$P = nkT\left(1 + \frac{2\pi}{3} nD^3 g(D)\right)$$

here $g(r)$ is two-point correlation function of particles. And D is the minimum distance between two adjacent particles.

Good luck, Movahed