SIGNATURE ______________________ NAME ____________________________

Student ID # ___________________

Physics 404 FINAL Exam
Spring 2010 Prof. Anlage
18 May, 2010
Crib Sheet allowed, CLOSED BOOK, NO Calculator or electronics Permitted

Point totals are given for each part of the question.

If you run out of room, continue writing on the back of the same page. If you do so, make a note on the front part of the page!
Note: You must solve the problem following the instructions given in the problem. Correct answers alone will not receive full credit.
If you have trouble with one question, go on to the others; most of the problems have easy parts.

Partial Credit:

→ Show Your Work! Answers written with no explanation will not receive full credit.
→ You can receive credit for describing the method you would use to solve a problem, even if you missed an earlier part.

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Problem	Credit	Max. Credit
1		25
2		25
3		25
4		25
TOTAL		100

$$\int_{-\infty}^{+\infty} \exp(-x^2)dx = \pi^{1/2} \qquad \int_{-\infty}^{+\infty} x^2\exp(-x^2)dx = \frac{\pi^{1/2}}{2} \qquad n! \cong (2\pi n)^{1/2} n^n \exp\left[-n + \frac{1}{12n}\right] \qquad \frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$$

$$Z_{\text{classical, d=1}} = \frac{1}{h}\iint e^{\left(\frac{-H(p,q)}{\tau}\right)} dpdq \qquad Z = \sum_s e^{-\varepsilon_s/\tau} \qquad \mathcal{Z} = \sum_N e^{-N\mu/\tau} \sum_s e^{-\varepsilon_s(N)/\tau}$$

$$C_V = \frac{\partial U}{\partial \tau}\Big|_V \qquad \int \log(x)dx = x\log(x) - x \qquad dU(\sigma, V, N) = \tau\, d\sigma - p\, dV + \mu\, dN$$

$$F = -\tau \log(Z) = U - \tau\sigma \qquad dF(\tau, V, N) = -\sigma\, d\tau - p\, dV + \mu\, dN \qquad \langle N \rangle = \sum_s f(\varepsilon_s)$$

$$d(XY) = X\, dY + Y\, dX \qquad \log(AB) = \log(A) + \log(B)$$

$$\log(A + B) \neq \log(A) + \log(B)$$

$$\frac{dp}{d\tau} = \frac{L}{\tau\, \Delta v} \qquad \left(P + \frac{N^2 a}{V^2}\right)(V - Nb) = N\tau \qquad G_g - G_l = \int V\, dP \qquad m = \tanh(m/t)$$

$$g(N,s) = \frac{N!}{\left(\frac{N}{2}+s\right)!\left(\frac{N}{2}-s\right)!} \cong \sqrt{\frac{2}{\pi N}}\, 2^N e^{-2s^2/N} \qquad \langle X \rangle = \sum_s X(s)P(s) \qquad P(v) = 4\pi\left(\frac{M}{2\pi\tau}\right)^{\frac{3}{2}} v^2 e^{-Mv^2/2\tau}$$