Hi everyone, quick question.

Alright, in McQuarrie (year 2000 edition), equation (5-8) defines the q_trans as

(2*pi*mkT/(h^2))^(3/2)*V

That's all well and good, and I can understand how they obtain this. However, later on in the chapter, they use the approximation Q=q^N/N! and then solve for entropy to get (5-20) as

S=k * ln(Q) = x * ln(q^N/N!) = N k ln ((2*pi*mkT/(h^2))^(3/2)*V *e^(5/2)/N)

sorry for the crappy equations, I didn't want to send latex jpeg's in case you wanted to post this.

Alright, so why does the e^(5/2)/N term appear instead of (1/N!) ? Is this some form of sterling's approximation that I might have missed? It seems that these terms seem to appear and disappear at will. Equation (5-16) has e^1 instead of e^(5/2) like 5-20.

Hope I didn't miss something obvious here, but I've been a bit stumped by this.

The entropy of an ideal gas can be calculated as:

S= (E-A)/T

We know that A=-kTlnQ

where Q=q^N/N! and q=(2pimkt/h^2)^{3/2}V=V/Lambda^3

We can use this to calculate lnQ, (using Sterlings Approximation):

lnQ=-NlnN + N + Nlnq = N ln (Ve/N/Lambda^3)

e comes from the fact that we incorporate the 'N' term in the logarithm and N*ln(e) = N.

Now,

A=-kTlnQ=-kT N ln (Ve/N/Lambda^3)

The Energy E of an ideal gas is given by

E=(3/2)NkT

We can then substitute S=(E-A)/T

S=(3/2)Nk+Nk ln (Ve/N/Lambda^3)

S=Nk(3/2 + ln (Ve/N/Lambda^3))

To put the '3/2' term in the ln term, we need to do the following:

3/2=ln(e^{3/2})

S=Nk(ln(e^{3/2})+ln (Ve/N/Lambda^3))=ln(V/N/Lambda^{3}*e^{5/2})

since

ln(e^{3/2})+ln(e)=ln(e^{5/2})

Hope this works..