

$$\int_0^{u_f} \phi(u) du + \frac{\pi^2}{6} (kT)^2 \left( \frac{\partial \phi(u)}{\partial u} \right)_{u=u_f} + 7 \frac{\pi^4}{360} (kT)^4 \left( \frac{\partial^2 \phi(u)}{\partial^2 u} \right)_{u=u_f} + \dots$$