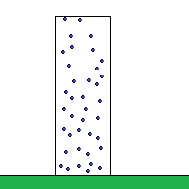
**Formula for Gravitational Work**

This is random, but for Thermo, I want a formula for calculating the work done on a set of free-floating particles by the gravitational field. So say we have such a set of particles in some column,



and we increase the gravitational field **g**, by some amount, δ**g**. What will be the work done? This depends on how the particles move in response of course. So anyway, we can say, over some infinitesimal time:



So we have:



We could’ve guessed this by just equating the work and the change in potential energy. So the work done over an infinitesimal time interval would be the potential times the infinitesimal change in density, integrated over all space. And if we want the work done over a finite length of time, we’d have to integrate this again,



So yeah.