1 Energy fluctuations

Consider a system of fixed volume in thermal contact with a resevoir. Show that the mean square fluctuations in the energy of the system is

$$\left\langle (\varepsilon - \langle \varepsilon \rangle)^2 \right\rangle = k_B T^2 \left(\frac{\partial U}{\partial T} \right)_V \tag{1}$$

Here U is the conventional symbol for $\langle \varepsilon \rangle$. *Hint:* Use the partition function Z to relate $\left(\frac{\partial U}{\partial T}\right)_V$ to the mean square fluctuation. Also, multiply out the term $(\cdots)^2$.