Physics 213 **Quiz 5-1 [20 points]** **Name**_____

1) [10 points] A brick is cooled from room temperature (20^0C) to -5^0C. How much are the energy, entropy, and free energy of the brick (with respect to room temperature) changed during this process? Assume that the heat capacity of the brick is C = 20 kJ/K.

$\Delta U =$

$\Delta S =$

$\Delta F =$

2) [10 points] A *non-ideal* heat engine operates between 400 K and 150 K. 400 J leaves the hot reservoir and 200 J of work is generated. What is the total entropy change of the engine and surroundings?

$\Delta S_{tot} =$