**HOMEWORK 3. Written Morally Due Feb 18. Oral DUE Feb 20**

1. (40 points) Assume Graph Isom is in P. Show that the following function can be computed in poly time

   - INPUT two graphs $G_1, G_2$
   - OUTPUT
     (a) If $G_1$ and $G_2$ are not isomorophic than output NO.
     (b) If $G_1$ and $G_2$ are isomorophic than output an isomorphism.

2. (50 points) TO BE GIVEN ORALLY ON THURSDAY FEB 20. (See below) So you can get a headstart.) Prove that Hamiltonian Cycle is NP-complete. Do this by showing 3-SAT $\leq$ HAMCYCLE. There are proofs of this on the Web- just Google "Hamiltonian Cycle is NP-complete" and you'll fine some (I found some great slides by Carl Kingsford who used to be here but is now at CMU.)

   Th 10-11: Jesse M, Emily H, Yi Q,

   Th 11-12: Casey M, Leo F, Hoseein E.

   Th 3:30-4:30 Bahadir O, Ahmed A, Ilse H

3. (0 points but will be a later Oral HW so take a look.) Prove that $NSPACE(\log n) \subseteq DSPACE((\log n)^2)$. The proof must be from first principles (e.g., you can't say 'this follows from Savitch's theorem') HINT- this is a special case of Savitch's theorem. You should look up Savitch's theorem, read it, and understand it completely. It first appeared in *Relationship between nondeterministic and deterministic space classes* by Savitch, Journal of Computing and Systems Sciences, Volume 4, 177-192, 1970. It is also in most complexity theory textbooks and there are probably notes on line about it.