Spring 2009 Abstract Algebra II Homework-Assignment 2 **Name:** ______________

Write-up your solution carefully including all the details of the proof. Due Tuesday, January 29.

Please staple your assignment.

(1) (5 points) Find an example of a finite group G that is not nilpotent but there exists H normal subgroup of G such that H and G/H are nilpotent.

(2) (5 points) Let H be a subgroup of S_n such that H is not contained in A_n. Show that exactly half the permutations in H are even.

(3) (5 points) Find all the conjugacy classes of D_4.

(4) (5 points) Show that any group of order $4n + 2$ has a subgroup of index 2.

(5) (5 points) Consider G be the collection of all matrices of the form

$$\begin{pmatrix} 1 & a & b \\ 0 & 1 & c \\ 0 & 0 & 1 \end{pmatrix}$$

where a, b, c are real numbers. Show that $(G, \cdot)$ is solvable.