Physics 129C, Spring 2002

Problem Set 1

Date assigned: March 4 **Due on March 11 at 1:00pm**

Bring the homework to 422 Downs, attn: Takuya Okuda and Xinkai Wu.

[1] Show that any finite groups of orders 2 and 3 are isomorphic to the cyclic groups S_2 and S_3.

(it Hint: What are possible multiplication tables?)

[2] Consider the following 6 functions,

$$f_1(x) = x, \quad f_2(x) = \frac{1}{x}, \quad f_3(x) = 1 - x, \quad f_4(x) = \frac{1}{1-x},$$

$$f_5(x) = \frac{x-1}{x}, \quad f_6(x) = \frac{x}{x-1}.$$

Define a product of two functions, f_i and f_j, by $(f_i \cdot f_j)(x) = f_i(f_j(x))$. Show that these 6 functions make a group under this multiplication rule. Write down the multiplication table and show that it is isomorphic to S_3.

[3] Consider C_{4v}, a congruent group of a square.

(a) Compute the group multiplication table and find all the conjugacy classes.

(b) Identify invariant subgroups of C_{4v}. For each of them, find a multiplication table of the coset group.