Physics 129C, Spring 2002

Problem Set 1

Date assigned: March 11 **Due on March 18 at 1:00pm**

Announcement: There will be no class meeting on April 16.
(make-up April 22, 4:30 - 5:30 at 103 Downs)

Reading Assignment: Chapters 1 and 2 of Tung.

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

[0] I was planning to discuss the notion of coset group on Tuesday, April 7, but I did not get there. So some of you may have had trouble solving the problem [3.b] of the problem set 1. I therefore am giving an extension to solve [3.b] for one week and am reassigning it as a problem in the problem set 2.

[1] Verify the following identities among cyclic permutations.

$$(a_1a_2a_3a_4a_5) = (a_1a_2a_3)(a_3a_4a_5) = (a_1a_4a_5)(a_1a_2a_3) = (a_1a_2)(a_2a_3)(a_3a_4)(a_4a_5),$$

$$(a_1a_2a_3a_4a_5)^{-1} = (a_1a_5a_4a_3a_2).$$

[2]

(a) How many conjugacy classes are there in S_4? How many elements are there in each conjugacy class?

(b) Compute the multiplication table of the class operators of S_4.

[3] For C_{3v}, the congruent group of an equilateral triangle, obtain the multiplication table for the class operators defined by

$$\mathbf{C}_1 = e, \quad \mathbf{C}_2 = c_3 + c_3^{-1}, \quad \mathbf{C}_3 = \sigma_1 + \sigma_2 + \sigma_3.$$