

## Homework 4

Due Monday February 11, 2008 at the beginning of class.

6. Let  $R$  be the regular representation of  $S_3$  over  $\mathbb{C}$ . Decompose  $R$  into irreducible representations.

*Remarks.*

1. So,  $R$  is the vector space

$$\mathbb{C}(1) \oplus \mathbb{C}(12) \oplus \mathbb{C}(13) \oplus \mathbb{C}(23) \oplus \mathbb{C}(123) \oplus \mathbb{C}(132),$$

and  $\sigma$  in  $S_3$  sends  $\tau$  in  $R$  to  $\sigma\tau$  in  $R$ .

2. Sometime in the next few days we will establish Corollary 2.18 in Fulton-Harris. This corollary says that each irreducible representation  $V_i$  of  $S_3$  appears in  $R$  exactly  $\dim V_i$  times.

3. We already know all three irreducible representations of  $S_3$ . So we already know all of the numerology. I would like to see explicit irreducible submodules of  $R$  that add up to  $R$ .