Repr. of Rings and Groups **Problem Set 8** *April 18, 2019*

1. Find the nonlinear irreducible representation of the quaternion group over $\mathbb{C}$.

2. Prove that the product of an irreducible and a linear character is an irreducible character.

3. The orientation preserving isometries of the cube form a group isomorphic to S_4. Is this representation irreducible?

4. Determine the character table of A_4 and S_4.

5. Which of the following class functions of S_4 are characters? Write the characters as sums of irreducible characters.

1	(..)(..)	(...)	(....)	(..)
5	2	-6	0	1
5	-1	$\frac{3}{2}$	1	0
8	0	-1	2	-2
4	0	-2	0	2

Hf1. Let G be a non-abelian group of order 28. Prove that G has an irreducible representation of degree 2 over $\mathbb{C}$.

Hf2. Complete the following table if we know that this is the character table of a finite group (the rows and columns are not necessarily in the usual order). What is the order of the group? Determine the sizes of its conjugacy classes and the orders of all normal subgroups.

1		1	-1		1	
1					-1	1
		1	-1			1
			0	0		-2
2		-2	0		$-i\sqrt{2}$	0
2	0		0			0