

3. Let  $G$  be the subgroup  $\{1, -1, i, -i\}$  of the group of non-zero complex numbers under multiplication.

(a) Record the multiplication table for  $G$ .

	1	i	-1	-i
1	1	i	-1	-i
i	i	-1	-i	1
-1	-1	-i	1	i
-i	-i	1	i	-1

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(b) In class we found 8 subgroups of the group  $D_4$ . Three of these subgroups had four elements, just like the group  $G$ . Does the multiplication table of  $G$  look more like the multiplication table of  $H = \{id, \rho, \rho^2, \rho^3\}$  or more like the multiplication table of  $K = \{id, \sigma\rho, \rho^2, \sigma\rho^3\}$ . Explain your answer. (I do not need to see a large number of details.)

The above table looks just like

	1	$\rho$	$\rho^2$	$\rho^3$
1	1	$\rho$	$\rho^2$	$\rho^3$
$\rho$	$\rho$	$\rho^2$	$\rho^3$	1
$\rho^2$	$\rho^2$	$\rho^3$	1	$\rho$
$\rho^3$	$\rho^3$	1	$\rho$	$\rho^2$

The top group consists of  $1, i, (i)^2, (i)^3$

The bottom group consists of  $1, \rho, \rho^2, \rho^3$

The group  $K$  is much different. Every element squares to the identity element