Subject:
Year: Month: Day: ( )

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Problem 1)

a) identity : $1 \times x$; $i \times -1 = -i$
$(i)^2 = -1$; $i \times -i = 1$

The 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

b) we will justify 5 axioms :

closure under multiplication: for all $a, b \in G$, $a \times b$ must be in G

Proof : every entry inside the grid is either 1, i, or -i , and since no new elements are there, the set is closed under multiplication.

Associative : $(a \cdot b) \cdot c = a \cdot (b \cdot c)$

Proof : multiplication of complex numbers is known to be associative, so associative holds.

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identity : $\exists e \in G$ st ~~a.e~~ and $e \times a = a$ and $a \times e = a$, for $\forall a$.

for all row and clounm for 1 ;

$1 \times 1 = 1$
$1 \times i = i$
$1 \times -1 = -1$
$1 \times -i = -i$

→ since multiplying by 1, leaves everything the same, 1 is the identity element.

Inverse : $\forall a \in G, \exists b \in G$ st, $a . b = 1$

The inverse of : 1 is $1 . 1 = 1$
i — $-i . i = 1$
-1 — $-1 . -1 = 1$
$-i$ — $-i . i = 1$

every element has a corresponding inverse in the set, so it is satisfied.

3. Commutativity: $a \times b = b . a$ for $a, b \in G$

table is symmetrical across the main diagonal so the operation is commutative