$3^4 = 4$ $\quad$ $1^4 = 4$

$3^5 = 5$ $\quad$ $1^5 = 5$

$3^6 = 1$ $\quad$ $1^6 = 0$

Matching up the corresponding powers under composition

$\phi_3: \quad 1 \to 0$

$2 \to 2$

$3 \to 1$

$4 \to 4$

$5 \to 5$

$6 \to 3$

Hence ϕ_3 is a homomorphism, since it is the mapping of the corresponding powers under composition of generators of two cyclic groups.

Write out the Cayley tables, using the mapping above

$\times_7$	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	1	3	5
3	3	6	2	5	1	4
4	4	1	5	2	6	3
5	5	3	1	6	4	2
6	6	5	4	3	2	1

$+_6$	0	2	1	4	5	3
0	0	2	1	4	5	3
2	2	4	3	0	1	5
1	1	3	2	5	0	4
4	4	0	5	2	3	1
5	5	1	0	3	4	2
3	3	5	4	1	2	0

With this mapping, the Cayley tables have identical patterns. We can say, therefore, more than that the function is a homomorphism; it is an isomorphism, (and alternatively, that since it is an isomorphism, it is also a homomorphism)

iv) $\phi_4 : (M, +) \to (\mathbb{R}, +)$

$A \to tr(A)$

If the function is a homomorphism, then

$\phi(M_1) \circ \phi(M_2) = \phi(M_1 \circ M_2)$