$= (A_1 \circ A_2) \circ A_3 (g)$ (Composition of functions is associative) ∴ $A(G)$ is a group

b) $I(G)$ is that set of elements of $A(G)$ such that for $i \in I(G)$, there exists $T \in G$ such that $i(g) = TgT^{-1}$

Closure

$i_2 \circ i_1 (g) = i_2(T_1 g T_1^{-1}) = T_2 T_1 g T_1^{-1} T_2^{-1}$
$= T_2 T_1 g (T_2 T_1)^{-1}$

∴ $i_2 \circ i_1 \in I(G)$

Identity

$i_e(g) = g = IgI^{-1}$ ∴ $i_e \in I(G)$

Inverses

$i \in I(G) \Rightarrow$ there exists $T_1 \in G$ such that $i(g) = TgT^{-1}$, but then $T^{-1} \in G$ since G is a group. If we define $i'(g) = T^{-1}gT$ then
$i' \circ i(G) = i'(TgT^{-1}) = T^{-1}TgT^{-1}T$
$= g$

and $i^{-1} \in G$

Normality: Let $a \in A(G)$, $i \in I(G)$

$a^{-1} \circ i \circ a(g)$

NO

Every automorphism $a \in A(G)$ can be represented by an invertible matrix, a say.

$(a^{-1} \circ i \circ a)(g) = a^{-1}TgT^{-1}a = (a^{-1}T)g(a^{-1}T)^{-1} \in I(G)$

the point is that not every automorphism a in $A(G)$ can be represented by an invertible matrix (cf. Part (iv)(c)).

∴ $I(G)$ is a normal subgroup of $A(G)$

c) If $C \in C(G)$ then C commutes with every element of G ∴ $C(G)T = TC(G)$