

24. $\phi(x) = x$; $\phi(x) = 9x$; $\phi(x) = 13x$; $\phi(x) = 17x$.

43. Observe that $\phi_g(y) = gyg^{-1}$ and
 $\phi_{zg}(y) = zgy(zg)^{-1} = zgyg^{-1}z^{-1} = gyg^{-1}$, since $z \in Z(G)$. So,
 $\phi_g = \phi_{zg}$.

47. By Exercise 45 $\phi_x = \phi_y$ implies $y^{-1}x$ is in $Z(S_n)$ and by Exercise 66 in Chapter 5, $Z(S_n) = \{\epsilon\}$.