Ex 8. Suppose ORBIT(x) and ORBIT(y) have a common element z:

$$z = g_1 x \quad , \quad z = g_2 y.$$

We want to show ORBIT(x) = ORBIT(y) For any point $u \in$ ORBIT(x), we write $u = g \cdot x$ for some $g \in G$. Since $x = g_1^{-1} z$

$$u = g(g^{-1} z) = (gg_1^{-1}) z = (gg_1^{-1})(g_2 \cdot y) = (gg_1^{-1} g_2) \cdot y.$$

which show $u =$ ORBIT(y) Therefore ORBIT(y) $<$ ORBIT(x). Similar we can prove ORBIT(x) $<$ ORBIT(y) Thus we proved.

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