

3.

$F: X \rightarrow X$ ,  $G: Y \rightarrow Y$  conjugate via  $h: X \rightarrow Y$ .

So  $h \circ F(x) = G \circ h(x)$ .

Let  $\{x_0, x_1, \dots, x_{N-1}\}$  be an  $N$ -cycle for  $F$ .

Set  $y_j = h(x_j)$  for  $j = 0, 1, \dots, N-1$ .

Then 
$$\begin{aligned} y_{j+1} &= h(x_{j+1}) \\ &= h \circ F(x_j) = G \circ h(x_j) = G(y_j) \end{aligned}$$
 for  $j = 0, 1, \dots, N-2$ .

Since  $x_0 = F(x_{N-1})$ ,  
 $y_0 = h(x_0) = h \circ F(x_{N-1}) = G \circ h(x_{N-1}) = G(y_{N-1})$ .

Hence  $\{y_0, y_1, \dots, y_{N-1}\}$  is an  $N$ -cycle for  $G$ .