Hint for Problem 272

If the list $(i\ \sigma(i)\ \sigma^2(i)\ \ldots\ \sigma^n(i))$ does not have repeated elements but the list $(i\ \sigma(i)\ \sigma^2(i)\ \ldots\ \sigma^n(i)\ \sigma^{n+1}(i))$ does have repeated elements, then which element or elements are repeats?