*Proposition 2: Let k be the order of 𝜎, then iff k | m.*

**Proof**:

Let k be the order of 𝜎.

We have . Since k is the order of 𝜎, moves all elements around in a circle, which results in the same set. For , must behave the same way.

However, k is different from m that k is the smallest positive integer which satisfy so cycle all elements once. For m, it cycles the elements for some n times, and so m = kn.

Therefore, k | m.

We have k | m, therefore .

We are done 😊

*Proposition 3: Every cycle of length k has order k.*

**Proof**:

Suppose is a n-cycle which has an order of k.

Let

Assume that 0 < k < n

moves to . Since , must be equals to . However, the definition of cycle says that all are different. We see a contradiction here.

Therefore, .

Moreover, moves all in a circle one time. Since , then k = n.

We are done 😊

*Proposition 4: Disjoint cycles commute.*

**Proof**:

Let , where for all and .

Also,

The same goes for . Therefore, disjoint cycles commute.

We are done 😊

*Proposition 5: Let be a permutation of and let ~ be a relation of defined by:*

*for some*

*Prove that ~ is an equivalence relation.*

**Proof**:

Reflexive property:

Let k be the order of . That gives us

Symmetric property:

Let k be the order of . That gives us