(iii) There is no sequence \( P_{i_1}, \cdots, P_{i_l} \supseteq P_{i_k} = P_{i_1} \) and \( W_{P_{i_j}} \cap W_{P_{i_{j+1}}} \neq \emptyset \) for \( 1 \leq j \leq k-1 \).

Let \( a_i^j \) be the number of \( P \)'s whose stable manifold is of dimension \( i+j \). Then the numbers

\[
M_q = \sum_{k=0}^{n} \sum_{i=0}^{k} \binom{k}{i} a_{q+i}^k \quad \text{and} \quad R_q = \dim H^q(M; F),
\]

satisfy the Morse inequalities.

BIBLIOGRAPHY

5. ———, Stable manifolds for differential equations and diffeomorphisms, Columbia University, mimeographed notes.

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COLUMBIA UNIVERSITY

COHOMOLOGY OF CYCLIC GROUPS
OF PRIME SQUARE ORDER

BY J. T. PARR
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1. Introduction. Let \( G \) be a cyclic group of order \( p^2 \), \( p \) a prime, and let \( U \) be its unique proper subgroup. If \( A \) is any \( G \)-module, then the four cohomology groups

\[
H^0(G, A) \quad H^1(G, A) \quad H^0(U, A) \quad H^1(U, A)
\]

determine all the cohomology groups of \( A \) with respect to \( G \) and to \( U \). We have determined what values this ordered set of four groups takes on as \( A \) runs through all finitely generated \( G \)-modules.

2. Methods of proof. First we show that every finitely generated \( G \)-module has the same cohomology as some finitely generated \( R \)-torsion free \( RG \)-module, where \( R \) is the ring of \( p \)-adic integers. Be-
cause the cohomology of a direct sum is the direct sum of the co-
homologies, we can construct the cohomology of any module from
that of the indecomposable modules. A. Heller and I. Reiner have
shown that any finitely generated $\mathcal{R}$-torsion free indecomposable
$\mathcal{R}\mathcal{G}$-module is one of four standard modules or is imbedded in one of
five exact sequences \[2\. We compute directly the cohomology of the
standard modules; the exact sequences give rise to cohomological
exact sequences from which we obtain certain restrictions on the
cohomology. The remaining uncertainty is resolved by computations
based on the notion of $\mathcal{R}$-enlargements \[1] applied to the five exact
sequences.

3. **Results.** The cohomology of any finitely generated $\mathcal{G}$-module
is a direct sum of finitely many of the following:

<table>
<thead>
<tr>
<th>$H^0(G, A)$</th>
<th>$H^1(G, A)$</th>
<th>$H^0(U, A)$</th>
<th>$H^1(U, A)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mathbb{Z}_p$</td>
<td>0</td>
<td>$\mathbb{Z}_p$</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>$\mathbb{Z}_p^2$</td>
<td>0</td>
<td>$\mathbb{Z}_p$</td>
</tr>
<tr>
<td>$\mathbb{Z}_p$</td>
<td>0</td>
<td>$p\mathbb{Z}_p$</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>$\mathbb{Z}_p$</td>
<td>0</td>
<td>$(p-1)\mathbb{Z}_p$</td>
</tr>
<tr>
<td>$\mathbb{Z}_p$</td>
<td>0</td>
<td>$(p-1)\mathbb{Z}_p$</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>$2\mathbb{Z}_p$</td>
<td>$(n+1)\mathbb{Z}_p$</td>
<td>$n\mathbb{Z}_p, n=1, \ldots, p$</td>
</tr>
<tr>
<td>$2\mathbb{Z}_p$</td>
<td>0</td>
<td>$n\mathbb{Z}_p$</td>
<td>$(n+1)\mathbb{Z}_p, n=1, \ldots, p-1$</td>
</tr>
</tbody>
</table>

**REFERENCES**


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