PRINT Your Name:

Get your course grade from TIPS/VIP late on Monday or later; or e-mail your e-mail address to me and I will e-mail your grade to you.

There are 20 problems on 8 pages. The exam is worth a total of 100 points. Each problem is worth 5 points.

1. DEFINE group isomorphism.
The function \( \phi : G \rightarrow G' \) from the group \( G \) to the group \( G' \) is a group isomorphism if \( \phi(xy) = \phi(x)\phi(y) \) for all \( x, y \) in \( G \) and \( \phi \) is one-to-one and onto.

2. DEFINE generator. If \( G \) is a group and \( g \) is an element of \( G \) with the property that every element of \( G \) is equal to some power of \( g \), then \( g \) is a generator of \( G \).

3. DEFINE centralizer. Let \( a \) be a fixed element of the group \( G \). The centralizer of \( a \) in \( G \) is the set of all elements of \( G \) which commute with \( a \).