

Final Review, Math 501
May 2, 2008

If you are uncertain if your solution is complete or may not be demonstrating what is intended please ask. Each problem is worth 10 points (equally weighted) so be sure to do those questions which you are most confident about success first.

The first four questions of the exam are similar (or exactly) comp exam questions for Math 501 material during the last couple years. The last four questions are more advanced and related to the course this semester specifically.

1. This question has three parts. It deals with definitions, properties and examples of Noetherian and Artinian modules.
2. This problem also has three parts. The first part has to do with definitions and examples of injective and projective modules. The second part has to do with the definition and examples of simple modules and the third part deals with the definition and examples of simple rings.
3. This problem has two parts. The first part has to do with tensor products of modules and their behavior with homomorphisms. The second part has to do with simplifying a homomorphism group between two modules.
4. This problem has two parts. Both have to do with group rings and when they are semi-simple or not.
5. This has to do with pullbacks and pushouts of diagrams of modules.
6. This has to do with Hilbert's basis theorem and endomorphisms of finitely generated modules.
7. This has two parts, both related to when a linear transformation of a finite dimensional vector space is diagonalizable. The first is related to its minimal polynomial and the second part has to do with the structure of the vector space as a module over the polynomial ring via the endomorphism.
8. This problem has to do with inverting an element of a PID and possible injective properties obtained. Baer's criterion is useful for this one.