ALGEBRA SEMINAR

Department of Mathematics
University of Texas at Arlington
presents

Dr. Roger Wiegand

Willa Cather Professor of Mathematics
Department of Mathematics
University of Nebraska-Lincoln

"Torsion in tensor products of modules"

Monday, October 12, 2009
4:00 p.m., 304 Pickard Hall
Refreshments served at 3:45pm

Abstract:

Let (R;m; k) be a local integral domain of dimension one, and let M and N be finitely generated R-modules. The tensor product M -R N usually has torsion,even if both M and N are torsion-free. Of course one can make the tensor product torsion-free by cheating: Take one of the modules to be torsion-free and the other one to be free! An honest example occurs over the ring C[[T4; T5; T6]]: Take M = (T4; T5) and N = (T4; T6), and check that M -R N is isomorphic to the maximal ideal (T4; T5; T6). Over the ring C[[T4; T5]], however, the tensor product of two non-free modules always has torsion. In fact, a 1994 theorem, due to Huneke and me, says that over a hypersurface domain of any dimension, if M -RN is maximal Cohen-Macaulay, then either M or N is free. (For one-dimensional domains,"maximal Cohen-Macaulay" is the same as \torsion-free".) A related question is the following: If M -R M¤ is maximal Cohen-Macaulay, must M be free? (HereM¤ = HomR(M;R).) There are no known counterexamples, and the answer is unknown even for one-dimensional complete intersections. I will discuss these problems, their relation to a celebrated conjecture due to Auslander and Reiten, and the fact that in some sense the pivotal case occurs in dimension one.

Web-Page for Seminars (Department of Mathematics, UTA)
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Contact Professor David Jorgensen at (817)272-5507 or djorgens@math.uta.edu for more information