Fall 2012: Algebra Graduate Exam

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Problem 1. Use Sylow's theorems directly to find, up to isomorphism, all possible structures of groups of order $5 \cdot 7 \cdot 23$.

Proof. □

Problem 2. Let A, B, and C be finitely generated $F[x] = R$ modules for F a field with C torsion free. Show that $A \otimes_R C \,?\, B \otimes_R C$ implies that $A \,?\, B$. Show by example that this conclusion can fail when C is not torsion free.

Proof. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ $\square$