1077-05-122 **Richard H Hammack*** (rhammack@vcu.edu), Dept. of Mathematics and Applied Mathematics, Virginia Commonwealth University, Box 842014, Richmond, VA 23284-2014. *Cancellation for the direct product of digraphs.*

This talk concerns the *cancellation problem* for the direct product $A \times B$ of digraphs. Given digraphs A, B and C, we say that *cancellation holds* if $A \times C \cong B \times C$ implies $A \cong B$.

A classic result by Lovász gives exact conditions on C that guarantee whether cancellation holds or fails: If C admits a homomorphism into a disjoint union of directed cycles of prime lengths, then there exist non-isomorphic digraphs A and B for which $A \times C \cong B \times C$. Conversely, if no such homomorphism exists, then $A \times C \cong B \times C$ implies $A \cong B$.

However, this does not entirely resolve the cancellation problem. If C is arbitrary, we might reasonably ask what conditions on A (or B) guarantee that $A \times C \cong B \times C$ implies $A \cong B$. This talk spells out those exact conditions. Moreover, for arbitrary A and C we enumerate and describe all digraphs B for which $A \times C \cong B \times C$. The solution involves a new construction called the *factorial* of a digraph. (Received July 28, 2011)