

TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 16 November 2011, 4:00 p.m.
(tea at 3:45)

Exact Relations for Fiber-Reinforced Elastic Composites

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Abstract. Predicting the effective elastic properties of a composite material based on the properties of the constituent materials is extremely difficult, even when the microstructure is known. However, there are cases where certain properties in constituents are also present in a composite, regardless of microstructure. We call such instances *exact relations*. The general theory of exact relations allows us to find all of these relations in a wide variety of contexts including elasticity, conductivity, and piezoelectricity. We combine this theory with ideas from representation theory to find all exact relations for fiber-reinforced polycrystalline composites, a large and widely used class of materials. In particular, for composites made with materials with certain rotational symmetries we are able to derive explicit formulas for effective tensors.