1057-30-27 **Alexander J. Izzo*** (`aizzo@math.bgsu.edu`), Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, OH 43403. *A Tetrachotomy for Certain Algebras Containing the Disc Algebra.*

We will answer a question raised by Joseph Cima. Let D denote the open unit disc in the plane, and let $A(D)$ denote the disc algebra. A theorem of E. M. Čirka asserts that if f is a function in $C(\overline{D})$ and f is harmonic but nonholomorphic on D, then the uniformly closed subalgebra $A(D)[f]$ of $C(\overline{D})$ generated by $A(D)$ and f is equal to $C(\overline{D})$. An analogous result for $H^\infty(D)$ was proved by Sheldon Axler and Allen Shields: If f is a bounded function on D that is harmonic but nonholomorphic, then the uniformly closed subalgebra $H^\infty(D)[f]$ of $L^\infty(D)$ generated by $H^\infty(D)$ and f contains $C(\overline{D})$.

Taken together these two theorems suggest that perhaps the inclusion $A(D)[f] \supset C(\overline{D})$ holds whenever f is a bounded harmonic nonholomorphic function on D. However, this is false; it is not even true that $A(D)[f, \overline{f}\,] \supset C(\overline{D})$ whenever $f \in H^\infty(D)$. This led Cima to ask which continuous functions are in $A(D)[f]$ or $A(D)[f, \overline{f}\,]$ when the inclusion $A(D)[f] \supset C(\overline{D})$ or $A(D)[f, \overline{f}\,] \supset C(\overline{D})$ fails. We will answer this question for $A(D)[f, \overline{f}\,]$. (Received December 03, 2009)