INTEGRAL CLOSURE OF MONOMIAL IDEALS: THE MAXIMAL CASE

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In this project we study certain types of polynomial *ideals*, that is, certain collections of polynomials functions $f(x, y, z)$ in three variables x, y, z, that are closed under addition and multiplication by arbitrary polynomials. A set that captures the entire geometry associated with the ideal is its *radical*, a large ideal that may be difficult to study. A stepping stone to the radical is the ideal's *integral closure*, the set of all elements that are zeros of a specific polynomial equation. A natural question is to determine whether an ideal is equal to its integral closure; such ideals are called *integrally closed*. In particular, one can form the product of two integrally closed monomial ideals and ask this question. We study the case when one of the ideals I contains polynomials that are of the form $f \cdot x^a + g \cdot y^b + h \cdot z^c$ and the other ideal J consists of all polynomials with zero constant coefficient. We prove that for any choice of a, b, c, the product ideal $I \cdot J$ is integrally closed.