PLANAR GRAPHS, BASS NUMBERS AND THE KOSZUL ALGEBRA STRUCTURE FOR TRIVARIATE MONOMIAL IDEALS

ABSTRACT. We will explore the Koszul algebra structure for $R = S/I$, where $S = \Bbbk[x, y, z]$ and I is a monomial ideal primary to the homogeneous maximal ideal $\mathfrak{m}$ of R such that $I \subseteq \mathfrak{m}^2$. Miller and Sturmfels showed that the minimal free resolution of any trivariate monomial ideal can be represented by some planar graph. We will discuss how we can relate the minimal free resolution of R and a corresponding planar map to the Koszul algebra structure of R. Our classification is based off of recent work by L. Avramov where he classified the behavior of the Bass numbers of embedding codepth 3 commutative local rings. His classification relied on a corresponding classification of their respective Koszul algebras, which is comprised of five categories. We find that this perspective also yields some interesting results/questions about which lower Bass numbers and Koszul algebra structures we can achieve from trivariate monomial ideals.