Meeting: 999, Nashville, Tennessee, SS 6A, Special Session on Local and Homological Algebra

999-13-232 **Daniel L. Katz** and **Emanoil Theodorescu*** (theodore@math.missouri.edu), 007 Mathematical Sciences Building, Columbia, MO 65201. *Hilbert Polynomials Associated to Tor and Ext for Powers of Ideals.* Preliminary report.

Let (R, m, k) be a Noetherian, quasi-unmixed local ring of dimension d. Let I be an ideal and M, N be finitely generated R-modules. It is known that the lengths (if finite) of (i) $Tor_i(M, N/I^nN)$, (ii) $Ext^i(M, N/I^nN)$ and (with some restrictions) (iii) $Ext^i(N/I^nN, M)$ are given by polynomials, if $n >> 0$. In some cases, we get their degrees and leading coefficients. The former are bounded above by, resp., $\max\{\dim Tor_i(M, N), \ell_N(I)-1\}$, $\max\{\dim Ext^i(M, N), \ell_N(I)-1\}$, and a slightly more complicated formula for case (iii). We investigate whether these upper bounds are the actual degree. In cases (i) and (ii) we take $M = k$, $N = R$ and assume I is normal. If $\ell(I) = d$, we show that the Betti and Bass numbers of I^n are given by polynomials of degree $d - 1$. Thus, the analytic spread, rather than the height of I, is involved. We give an upper bound for the leading coefficient and, if I is m-primary (normal), we identify it. If $\ell(I) < d$, we get a simpler form for their degree and leading coefficient. In case (i), we give a simpler proof of a result by V. Kodiyalam, with $M = k$, $N = R$ and $I = m^t$. In case (iii), we take $M = N = R$, $i = d$, and I m-primary. Then, $length(Ext^d(R/I^n, R))$ has the same leading term as $length(R/I^n)$. (Received August 24, 2004)