Let $R$ be a standard graded polynomial ring over a field $K$ and let $I$ be a homogeneous ideal of $R$. We investigate what can be said about $\text{reg}(R/I)$ in terms of some of the maximal degree syzygies. We write $t_i = \text{reg} \text{Tor}_i(R/I, K)$. Examples of Mayr and Meyer show that $t_2$ can be double exponential in terms of $t_1$. We show that $\text{reg}(R/I)$ is bounded by a polynomial in $t_1...t_h$, where $h$ is at least $1/2 \text{dim} R$. We also discuss similar results and the possibility of stronger bounds. (Received September 03, 2012)