Throughout, let $\rho' = \beta' + i\gamma'$ denote a zero of $\zeta'(s)$. Assuming the Riemann Hypothesis, we show that if $\beta' \geq 1$ and $4 \leq T \leq \gamma' \leq 2T$, then $|\zeta(\rho')| \leq \frac{1}{2}e^{C_0}\log T + O(1)$ where $C_0$ is Euler’s constant. We conjecture that if $\beta' \geq 1$ and $4 \leq T \leq \gamma' \leq 2T$, then $\zeta(\rho')| \leq \left(\frac{1}{2}e^{C_0} + o(1)\right)\log T$. For all $T \geq 4$ we show unconditionally that there exists a $\rho'$ with $\beta' \geq 1$ and $T \leq \gamma' \leq 2T$ such that $|\zeta(\rho')| \geq \left(\frac{1}{2}e^{C_0} - o(1)\right)\log T$. The proof of this depends on a quantitative version of Kronecker’s theorem for inhomogenous Diophantine approximation. (Received September 17, 2013)