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**Derek Orr\*** (djo15@pitt.edu), 301 Thackeray Avenue, Pittsburgh, PA 15213. *Rational zeta series for  $\zeta(2n)$  and  $\zeta(2n + 1)$ .*

I will begin by using the cotangent function to find rational zeta series with  $\zeta(2n)$  in terms of  $\zeta(2k + 1)$  and  $\beta(2k)$ , the Dirichlet beta function. I then develop a certain family of generalized rational zeta series using the generalized Clausen function  $\text{Cl}_m(x)$  and use those results to discover a second family of generalized rational zeta series. As a special case of my results from Theorem 3.1, I prove a conjecture given in 2012 by F.M.S. Lima. Later, I use the same analysis but for the digamma function  $\psi(x)$  and negapolygammas  $\psi^{(-m)}(x)$ . With these, I extract the same two families of generalized rational zeta series with  $\zeta(2n + 1)$  on the numerator rather than  $\zeta(2n)$ . Afterwards, I look into the applications of these rational zeta series and how they are related to other special functions such as the multiple zeta function. (Received February 08, 2020)