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**Emily Gullerud\*** (gullerej@uwec.edu) and **aBa Mbirika** (mbirika@uwec.edu). *An Euler phi function for the Eisenstein integers and some applications.* Preliminary report.

The Euler phi function on a given integer  $n$  yields the number of positive integers less than and relatively prime to  $n$ . Equivalently, it gives the order of the group of units in the quotient ring  $\mathbb{Z}/(n)$  for a given integer  $n$ . We generalize the Euler phi function to the Eisenstein integer ring  $\mathbb{Z}[\rho]$  where  $\rho$  is the primitive third root of unity  $e^{2\pi i/3}$  by finding the order of the group of units in the ring  $\mathbb{Z}[\rho]/(\theta)$  for any given Eisenstein integer  $\theta$ . As one application, we prove that the celebrated Euler-Fermat theorem holds for the Eisenstein integers. Time permitting, we discuss the structure of certain unit groups  $(\mathbb{Z}[\rho]/(\gamma^n))^\times$  where  $\gamma$  is prime in  $\mathbb{Z}[\rho]$  and  $n \in \mathbb{N}$ , thereby generalizing well-known results of similar applications in the integers and some lesser known results in the Gaussian integers. (Received September 25, 2017)