FLORIDA GULF COAST UNIVERISTY
DEPARTMENT OF MATHEMATICS

MATHEMATICS SEMINAR

FRIDAY

NOVEMBER 17TH, 2017
FLORIDA GULF COAST UNIVERSITY
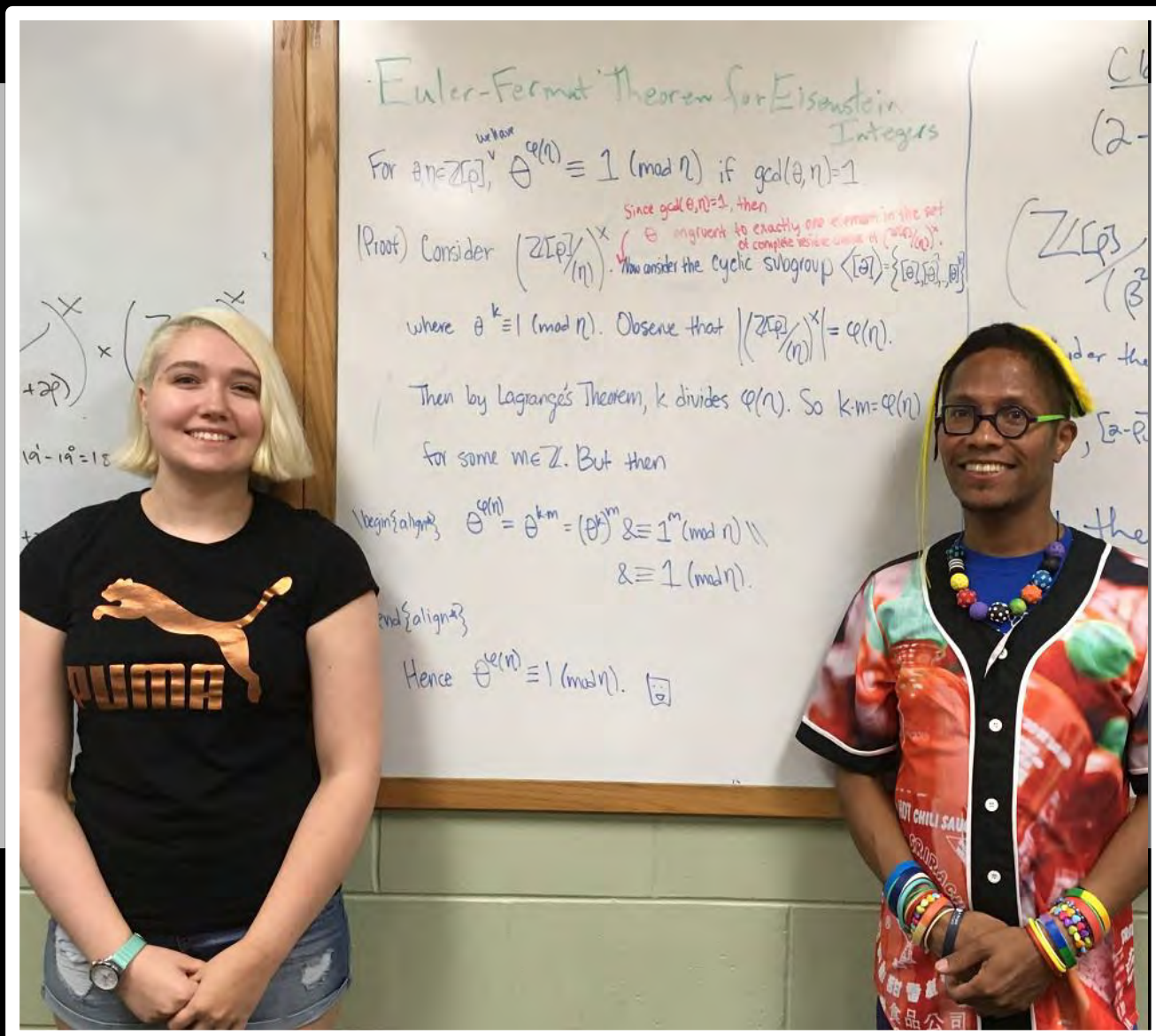
ROOM 100

MARIEB HALL
11:30 AM– 12:30 PM

AN EULER PHI FUNCTION FOR THE EISENSTEIN INTEGERS AND SOME TANTALIZING APPLICATIONS

GUEST SPEAKERS:

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ABSTRACT:

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 ρ 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 θ. As one application, we prove that the celebrated Euler-Fermat theorem holds for the Eisenstein integers. We also discuss the structure of certain unit groups $(\mathbb{Z}[\rho]/(\gamma^n))^{\times}$ where γ 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.

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