Utilizing Convergence Tests and Complex Analysis To Redefine the Provability of the Partition Formula

Steinberg, Emilie (School: Dr. Michael M. Krop Senior High School)

In my research, I redefined the Hardy- Ramanujan Formula that was created in 1917. This formula is used to depict the numbers of ways any integer can be split up, known as integer partitions. In the J.B. Newman Proof, a simplified method for approaching this finite value was analyzed with complex analysis. The expected value that J.B. Newman and the Hardy- Ramanujan Formula proved was p(n)=exp(n)^/2n-3(4n^/3). Using calculus, I defined each step of the proof using identities throughout trigonometry. I predicted that the proof can be redefined using series relationships as seen in the formula for geometric series. In order to follow and review each step of the proof of this complex equation, I used the series divergence test and integral test from Calculus. Since I ensured that all the conditions for each simplification process were met, I expected the results to be the same. Essentially, I set a range and domain for each prospective equation to ensure its accuracy. However, this was only a rough estimate. In terms of logarithms, I expanded the sum and isolated each variable "z." Moreover, I analyzed the different values that each series or sum approaches or converges too. Lastly, I collected these convergent points and formed an equation to generate two circles, varying in radius, to analyze the variation. I continued simplifying with logarithmic values to arrive at a final convergent value.

Awards Won:

Mu Alpha Theta, National High School and Two-Year College Mathematics Honor Society: Second Award of $1,000

Central Intelligence Agency: First Award: $1000 award