1147-11-471 **Kim Klinger-Logan*** (kling202@umn.edu), 127 Vincent Hall, 206 Church Street, Minneapolis, MN 55455. *An application of differential equations in automorphic forms to gravitational physics.*

Physicists such as Green, Vanhove, et al show that differential equations involving automorphic forms govern the behavior of gravitons. One particular point of interest is solutions to $(\Delta - \lambda)u = E_\alpha E_\beta$ on an arithmetic quotient of the exceptional group E_8. We establish that the existence of a solution to $(\Delta - \lambda)u = E_\alpha E_\beta$ on the simpler space $SL_2(\mathbb{Z})\backslash SL_2(\mathbb{R})$ for certain values of α and β depends on nontrivial zeros of the Riemann zeta function $\zeta(s)$. Further, when such a solution exists, we use spectral theory to solve $(\Delta - \lambda)u = E_\alpha E_\beta$ on $SL_2(\mathbb{Z})\backslash SL_2(\mathbb{R})$ and provide proof of the meromorphic continuation of the solution. The construction of such a solution uses Arthur truncation, the Maass-Selberg formula, and automorphic Sobolev spaces. We also hope to speculate on future directions towards a solution on higher rank quotients. (Received January 24, 2019)