This is my recommendation letter for Jacob Honeycutt's graduate school applications. It has all the relevant information for my nomination of him for an award in the School.

CLEMSON
College of SCIENCE

December 10, 2018

DEPARTMENT OF
MATHEMATICAL SCIENCES

Clemson University
220 Parkway Dr.
O-110 Martin Hall
Clemson, SC
29634-0975

P 864-656-3434
F 864-656-5230
mathsci@clemson.edu

Recommendation letter for Jacob Honeycutt

It is my pleasure to write in support of Jacob Honeycutt's application for admission to your graduate program. I have known Jacob since Spring 2017 when he took my undergraduate abstract algebra course. This year, he is working with me on a research project in combinatorial commutative algebra. He is quite smart and hard working, and he enjoys learning and conducting mathematics research very much. I recommend him to you strongly.

Jacob took my abstract algebra course when he was a sophomore. He was definitely the youngest student in the class, with the other students being juniors and seniors. He earned a B in the course, which was pretty fantastic under these circumstances. Every class meeting he sat at the front of the class, and he was always highly engaged with the material, much more so than many of the other students.

Last spring I invited Jacob to work on a research project with me in combinatorial commutative algebra. Broadly, this area uses algebra (rings, ideals, and so on) to study combinatorial objects like graphs, simplicial complexes, and partially ordered sets. This is done by using the combinatorial object to build an ideal in a polynomial ring so that certain combinatorial properties of the original object are reflected in the algebraic properties of the ideal. For instance, given a finite simple graph G, the edge ideal of the graph is the ideal generated by the edges in the polynomial ring with variables given by the vertices of the graph; e.g., the edge ideal of the path $1-2-3$ is the ideal $\langle x_1x_2, x_2x_3\rangle$. Many properties of G can be seen in its edge ideal. For instance, the minimal irreducible decomposition of the ideal is determined by the vertex covers of G, which are subsets of the vertex set that satisfy a domination property for the edges of G.

Jacob's project investigates a new variation of this where the vertex covers are replaced by the dominating sets, subsets of the vertex set that dominate the vertices instead of the edges. As of the writing of this letter, Jacob has just started investigating this construction. He spent the bulk of the fall semester on independent background reading on topics he'll need for his investigation. Throughout the semester, we met weekly to discuss the readings and practice exercises I assigned to help him process the material. Jacob devoured the readings and completed most of the exercises without any assistance. In addition, he asked very insightful questions during our meetings that indicate to me that he is already thinking like a researcher: reading critically and thinking about how results can be extended and applied to other situations. In addition, he took it upon himself to learn the computer algebra system Macaulay2. The book he is using has a lot of information about Macaulay2, but I didn't require him to learn it.

In the last couple of weeks, I introduced Jacob to dominating sets for graphs and explained the construction I want him to investigate. He immediately started working through examples, observing patterns, making guesses about questions I posed to him, and asking his own questions. I am excited to see where he goes with this

construction. I anticipate that the project will result in a research paper that we will submit for publication in a peer-reviewed research journal.

Lastly, it is worth noting that Jacob is a teaching assistant for a course in our school. So, not only is he ready for graduate coursework and research, but he also already has some teaching experience under his belt.

Jacob Honeycutt is a smart and hard-working student and researcher of mathematics, with experience as an independent scholar and as a teaching assistant. He will be a valued member of your program, and I recommend him to you strongly.

If you have any questions for me regarding this recommendation, do not hesitate to contact me.

Best wishes,

Sean Sather-Wagstaff
Associate Professor
ssather@clemson.edu