



April 5, 2022

To whom it may concern:

This letter certifies that as of April 4, 2022, **Chanyang Ryoo** has completed the deposit and all the academic requirements for the degree of Doctor of Philosophy (Ph.D.) at Columbia University in the City of New York.

The Ph.D. will be conferred on May 18, 2022.

Best regards,

Priscilla H. Yuen
Assistant Director of Student Affairs
Dissertation Management
Office of the Dean

PY

cc: Department of Applied Mathematics