Notice of the Final Oral Examination
for the Degree of Master of Science

of

MACKENZIE WHEELER

BSc (University of Victoria, 2017)

"Chromatic Polynomials of Mixed Graphs"

Department of Mathematics and Statistics

Wednesday, August 21, 2019
11:00 A.M.
Clearihue Building
Room B007

Supervisory Committee:
Dr. Gary MacGillivray, Department of Mathematics and Statistics, University of Victoria (Supervisor)
Dr. Peter Dukes, Department of Mathematics and Statistics, UVic (Member)

External Examiner:
Dr. Danielle Cox, Department of Mathematics, Mount Saint Vincent University

Chair of Oral Examination:
Dr. Michel Lefebvre, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Let $G = (V, A, E)$ be a mixed graph and $c_o : V \to \{1, 2, ..., \lambda\}$ a function such that c_o is a proper colouring of the underlying graph, $Und(G)$, and $c_o(u) \neq c_o(y)$ when $c_o(v) = c_o(x)$, for every pair of arcs (u, v) and (x, y). Such a function is called a proper oriented colouring of G. The number of proper oriented λ−colourings of G, denoted $f_o(G, \lambda)$, is a polynomial in λ. We call $f_o(G, \lambda)$ the mixed-chromatic polynomial of G.

In this thesis we will first present the basic theory of the mixed-chromatic polynomial. This theory will include computational tools and results concerning the coefficients of $f_o(G, \lambda)$. Next, we will consider the question of chromatic uniqueness and invariance of mixed graphs. Lastly, we reformulate a contract-delete recurrence for chromatic polynomials in order to enumerate various colourings, such as k−frugal λ−colourings.