MAT247H1S **2018**

Kudla **Algebra II**

Final Exam Information

The Final Exam will be held on **Friday, April 20th, 2–5pm**.
There will be **two locations**. Please make sure that you go to the correct one:
• A–S in NR 25 (NR= New College, 45 Willcocks St.
• T–Z in WI 1017 (WI = Wilson Hall-New College, 40 Willcocks St.
Please be sure to bring your University ID with you to the exam, since these will be checked.

In addition to the material listed on the midterm review sheet, the exam will cover material from the following sections, as discussed in class: 5.4, 6.3, 6.4, 6.5 (up to p. 385), 6.6, 7.1, 7.2, 7.3, and 7.4. In particular, you only need to know what is covered in class concerning minimal polynomials and the rational canonical form.

You should know how to do problems similar to those assigned for homework. You should know precise definitions of important things, e.g., T-cyclic subspace, generalized eigenvector, Jordan canonical form, minimal polynomial, companion matrix, etc. In the following list, you should be able to state and prove the Theorems marked with $\star$. (You are no longer responsible for the proofs of the $\star$'ed Theorems on the first review sheet.)

Important topics are the following:

- normal and self-adjoint operators, Theorem 6.14* (Schur's Theorem)
- Theorems 6.16 and 6.17, criterion for the existence of an orthonormal basis of eigenvectors in the real and complex case
- unitary and orthogonal operators, Theorem 6.18
- projections and orthogonal projections and their characterization, Theorem 6.24*
- The spectral theorem, Theorem 6.25*
- T-invariant subspaces, the T-cyclic subspace generated by a vector x, Theorem 5.22*
- Theorem 5.23 (the Hamilton-Cayley Theorem)
- definition of a direct sum decomposition $V = W_1 \oplus \cdots \oplus W_k$.
- generalized eigenvectors and generalized eigenspaces.
- Jordan blocks, cycles of generalized eigenvectors
- Jordan canonical form, including how to compute it in (easy) examples.
- the minimal polynomials $M_T(t)$ and $M_A(t)$ for a linear transformation and a matrix.
- rational canonical form
- companion matrices and their relation to cyclic subspaces generated by a vector x.

Material on group theory and symmetries discussed in the last two lectures will *not* be on final exam.

The exam will consist of 7 questions and no calculators will be allowed.