MATH 3407, Advanced Linear Algebra
Semester 2, 2019
Class Overview

This information is approximate and is subject to change during the semester.

The class is roughly divided into two parts:

1. First five weeks: the basics, done the "adult way": more abstract, with less emphasis on numbers and row-reduction;
2. Other eight weeks: further topics (these contain calculations as well as theory).

Below is a quick comparison of this class with Math 2207 (Introductory Linear Algebra); for simplicity, not all topics in each class are listed. **You are expected to be familiar with the course content of Math 2207** as written in `http://www.math.hkbu.edu.hk/~amypang/2207/linalbook.pdf`.

Math 2207 (Introductory)	Math 3407 (Advanced)
Vector spaces, mostly finite-dimensional: $\mathbb{R}^n$, matrices, polynomials; scalars: $\mathbb{R}$	More unusual vector spaces, including infinite-dimensional; scalars: $\mathbb{R}$, $\mathbb{C}$, ...
Linear combinations of vectors; subspaces	Combining subspaces
Study linear transformations through its matrices relative to different bases	Study linear transformations more abstractly, with and without matrices
Eigenvectors and diagonalisation: $A = PDP^{-1}$	Triangular form and Jordan form for non-diagonalisable matrices: $A = PJP^{-1}$
	Linear forms (functions: vector space $\to \mathbb{R}$)
Orthogonality and dot product (in $\mathbb{R}^n$)	Quadratic forms and inner product spaces (of abstract vectors)

Some other differences:

Most examples / questions are about $\mathbb{R}^n$	Most examples / questions are about abstract vector spaces, e.g. matrices, functions
You are expected to write simple proofs by recalling definitions and rearranging equations; anything harder is a challenge question	You are expected to write more complicated proofs
Vectors are $\mathbf{v}, \mathbf{w}$ or handwritten $\vec{v}$; linear transformations are S, T, f	Vectors are α, β (no arrows nor bold print); linear transformations are σ, τ.
Complete lecture slides available	Class is "written live" and based on textbook; photos of the whiteboard available after class

To save writing time, you are expected to be familiar with the shorthands:
$\therefore$ (therefore),
$\because$ (because),
$\forall$ (for all),
$\exists$ (there exists),
$\implies$ (implies),
$\Leftrightarrow$, "iff" (if and only if).