MATH 460 — Course Outline

Directed Individual Study on Category Theory

Jordan Mitchell Barrett

Trimester 2, 2020

Course information

Description: The fundamental notions of category theory, including categories, functors, natural transformations, adjoints, constructions, Yoneda lemma, (co)limits, monoids. A chance to investigate an application of category theory to a field of interest.

Supervisor: Dr Martino Lupini, CO426

Textbook: Saunders Mac Lane, *Categories for the Working Mathematician* (1998)

Assessment

Problem sets: 4 total, one corresponding to each assignment. These will be submitted by Jordan, marked and returned by Martino before each assignment is due, in order to give feedback on the assignment content. Worth 0% each.

Assignments: 4 total, due in weeks 3, 5, 7, 10, worth 15% each.

Investigation: into a chosen application of category theory to a field of interest. Final report ($\sim$10 pages) to be submitted on topic, worth 40%.

Week	Content	Mac Lane
1	Categories, functors, natural transformations	I.1–I.4
* 2	Monics, epis, initial/terminal objects, duality	I.5–II.2
3	Pullbacks/pushouts, (co)products, (co)equalisers	III.3–III.5
* 4	Universal arrows, limits, colimits	III.1, previous
5	Adjoints, equivalence of categories	IV.1–IV.4
MID-TRIMESTER BREAK		
* 6	Representables, Yoneda lemma, group objects	III.2, III.6
7	Monoidal categories	VII.1, VII.2
* 8	Monads, additive categories	VI.1–2, VIII.1–3
9–12	Investigation: *elementary topoi*	

* Assignment due on this content (due dates 27/7, 10/8, 7/9, 28/9 respectively)