1 Lecture 1

Goal: We will give an a priori overview of the proof, deriving finiteness in the real positive summable case from the existence of some sets we will call functional cochains which satisfy some set of axioms. First we will give a motivated introduction of each of the axioms. Then we will sketch out a trajectory along which we can prove that the axioms are sufficient for finiteness. Finally we will make an indication at how we will prove that such a set of functional cochains exists, essentially providing a sketch for the program in the coming week.

Corresponding parts in the preprint: Chapter 1-4

2 Lecture 2

Goal: We will prove that the axioms do indeed imply finiteness, accompanied by the list of results we will be needing from the axioms as we move on.

Corresponding parts in the preprint: Section 4.4

3 Lecture 3

Goal: We will go over the following definitions: Controllability, Standard domains, domains of almost degree d. We will point out some links with Riemann mapping theorem and germs of domains at ∞ on the Riemann sphere, in particular we will talk about a Theorem of Warschawski. Next we will talk about how these definitions from the beginning fit together.

Corresponding parts in the preprint: Sections 5.1-5.2, the Theorem of Warschawski is not used in the text but moreso useful for context.

4 Lecture 4

Goal: We will look at some consequences of the Ordering Theorem simplifying the relations $\preceq$ and $\sim$. Next we will present the Proposition to be proven in Lecture 5, about domains of functional cochains. We will talk about why this is important to get control of Stokes phenomena and we will prove the easy parts of this Theorem.

Corresponding parts in the preprint: Proposition 5.16, Corollary 5.19, Proposition 5.20.

5 Lecture 5

Goal: We will prove the hard part of Proposition 5.20 of the preprint.

Corresponding parts in the preprint: Proposition 5.20.

6 Lecture 6

Goal: We will present two Lemmas in order to simplify asymptotics with a sketch of proof. Then we will present a slightly different definition of STAR-terms from the text, perhaps more familiar to those who have looked at transserial asymptotics. We will prove that this is implied by the definition of STAR-terms in the text, in the sense that asymptotics with respect to one implies the other.

Corresponding parts in the preprint: Lemma 5.17, Lemma 5.18, Definition 5.21

7 Lecture 7

Goal: We will prove that the differential algebra generated by STAR-terms is ordered by a method based on the proof in the text, but slghtly more general. We will then do some comparisons with the original text of Ilyashenko and some tentative comparisons to the asymptotics of Écalle. We will come back to this on the final day.

Corresponding parts in the preprint: Theorem 5.22 part 2.

8 Lecture 8

Goal: We will prove that functional cochains actually do admit asymptotic approximations by the differential algebra generated by STAR-terms.

Corresponding parts in the preprint: Theorem 5.22 part 1.

9 Lecture 9

Goal: We will introduce cochains with sufficient additional data to get access to Maximum Modulus Theorem. We will then prove a version of the Cauchy-Heine transform with intersecting Stokes lines.

Corresponding parts in the preprint: Sections 6.1 + 6.3

10 Lecture 10

Goal: We will prove Repartitioning and sketch Phraghmén-Lindelöf for cochains. Assuming the correct partitions and Stokes phenomena for functional cochains we will show in broad strokes how to apply Phraghmén-Lindelöf to prove that if a functional cochain is smaller than any exponential on the real axis, it is zero.

Corresponding parts in the preprint: Sections 6.2 + 6.4 + 6.6

11 Lecture 11

Goal: We will prove functional cochains have the right partitions and Stokes phenomena.

Corresponding parts in the preprint: Section 6.5

12 Lecture 12

Goal: We will go over the proof again in broad strokes and prove the Analytic core more formally.

Corresponding parts in the preprint: 6.6

13 Lecture 13

Goal: We will show where the leeway in the proof lies and we will discuss some ideas for the general case.

14 Lecture 14

Goal: We will talk about some possible frameworks in which we could put this proof to make it more 'robust'. We will discuss some problems with naive asymptotics for all real analytic functions and some ideas for the future.