PHI 314 PHILOSOPHY OF MATHEMATICS SPRING 2023 J. BURGESS

Required readings in boldface Optional recommended readings in lightface

WEEK 1

TUE 31 JAN

Wigner "The Unreasonable Effectiveness of Mathematics"

[WignerUnreasonable]

The problem: mathematics seems to be a product of pure thought (a priori) but also seems to provide substantive knowledge about the world (synthetic). How is this possible?

THU 02 FEB

Hempel "Geometry & Empirical Science"

[**HempelGeometry**]

No, geometry is a posteriori (and arithmetic is analytic, as further readings will try to show by attempting to reduce it to logic)

WEEK 2

TUE 07 FEB

Hahn "The Crisis in Intuition"

[**HahnCrisis**]

Why the rigorization of mathematics became one main project of 19th century mathematics (the thesis of logicism, that mathematics reduces to logic, was a by-product of this project)

THU 09 FEB

Poincaré "The Nature of Mathematical Reasoning"

[**B&P 394-402**]

The question of the status of mathematics comes down to the question of the status of the principle of mathematical induction in arithmetic

WEEK 3

TUE 14 FEB

Frege "The Concept of Number"

[**B&P 130-159**]

Frege's attempt to show arithmetic, including induction, is analytic

THU 16 FEB

Russell ***Introduction to Mathematical Philosophy*** selections

[**B&P 160-182**]

Hempel "The Nature of Mathematical Truth"

[B&P 377-393]

Partial success but ultimate failure of Frege's attempt, Russell's attempt to do better

WEEK 4

TUE 21 FEB

Ayer **"The *A Priori*"**

[**B&P 315-328**]

Do we really need something like the Frege-Russell logicist project to show mathematics is analytic?

TUE 23 FEB

Heyting **"Intuitionist Foundations of Mathematics"**

[**B&P 52-60**]

Heyting "Disputation"

[B&P 66-76]

Brouwer **"Intuitionism & Formalism"**

[**B&P 77-89**]

Brouwer "Consciousness, Philosophy, Mathematics"

[B&P 90-96]

The intuitionist challenge to the logic of Frege and Russell, and to classical mathematics generally, in its original, almost solipsistic "Amsterdam" version

WEEK 5

TUE 28 FEB *FIRST PAPER DUE*

Dummett **"The Philosophical Basis of Intuitionistic Logic"**

[**B&P 97-129** but you may stop at 109]

The same challenge in its revised, almost behavioristic "Oxford" version

THU 02 MAR

Carroll **"What the Tortoise Said to Achilles"**

[**CarrollTortoise**]

May not these arguments "prove too much"?

WEEK 6

TUE 07 MAR

Hilbert **"On the Infinite"**

[**B&P 183-201**]

Von Neumann "Formalist Foundations of Mathematics"

[B&P 61-65]

A clever idea for getting the best of both worlds (logicism and intuitionism)

THU 09 MAR

Newman&Nagel "Gödel's Proof"

[NewmanGoedel]

The downfall of formalism: Gödel's theorem

SPRING BREAK

WEEK 7

TUE 21 MAR

Lucas **"Minds, Machines, Gödel"**

[**LucasMinds**]

Does Gödel's theorem have consequences for the philosophy of mind?

THU 23 MAR

Boolos **"The Iterative Concept of Set"**

[**B&P 486-502**]

The "foundation" for mathematics eventually adopted after the demise of all of the three schools

WEEK 8

TUE 28 MAR

Gödel **"What Is Cantor's Continuum Problem?"**

[**B&P 470-485**]

Gödel's own response to his theorem

THU 30 MAR *SECOND PAPER DUE*

Bernays **"On Platonism in Mathematics"**

[**B&P 258-271**]

Turning from the nature of mathematical truth to the nature of mathematical objects

WEEK 9

TUE 04 APR

White "The Locus of Mathematical Reality"

[**WhiteLocus**]

One view popular among amateur philosophers: they are mental entities.

THU 06 APR

Benacerraf "Mathematical Truth"

[**B&P 403-420**]

Another view (nominalism): They don't exist at all!

WEEK 10

TUE 11 APR

Colyvan "Indispensability Arguments"

[**ColyvanIndispensability**]

One kind of anti-nominalism

TUE 13 APR

Baker "Are There Genuinely Mathematical Explanations…"

[**BakerExplanations**]

An idiosyncratic response

WEEK 11

TUE 18 APR

Burgess "Why I Am Not a Nominalist" pages 72-81

[BurgessWhy]

Claims that mathematics is dispensable after all

THU 20 APR

Carnap "Empiricism, Semantics, Ontology"

[**B&P 241-257]**

Burgess "Why I Am Not a Nominalist" pages 51-72

[BurgessWhy]

Another kind of anti-nominalism

WEEK 12

TUE 25 APR

Benacerraf "What Numbers Could Not Be"

[**B&P 272-294**]

Structuralism: a view neither platonist nor nominalist

THU 27 APR

Avigad "Reliability of Mathematical Inference"

[**AvigadReliability**]

Aftermath

Dean's Date

TUE 09 MAY *THIRD & LAST PAPER DUE*

(Note that this is a University deadline, and any extension would require advance approval from the student's academic dean)

There will be no final exam, take-home or in-class