

Math 3TP3 - Truth and Provability

Winter, 2020

Description: Gödel's incompleteness theorem is one of the most talked about and misunderstood theorems in mathematics. Its proof was the culmination of a train of thought that dated back to the Greeks - can you be sure that mathematics is consistent? Gödel's work came at the end of a frantic period in the foundations of mathematics which began in the late 19th century. This course will take an historical approach and will plot a path through Peter Smith's book which will touch on the proofs of several of Gödel's theorems.

Instructor:

Bradd Hart

Office: Hamilton Hall 420

Office hours: TW 10:30 or by appointment

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Course meeting time: TWF 9:30 - 10:20. Check your schedule for your tutorial.

Recommended Course text: An introduction to Gödel's Theorems by Peter Smith

Course webpage: www.math.mcmaster.ca/~bradd/courses/math3tp3; a tentative weekly breakdown of the topics to be covered can be found here as well as course announcements and other material.

Test dates: There will be an in-class midterm on Feb. 14.

Assignments and presentation: There will be 5 assignments due roughly every two weeks and a presentation done in teams of 2 - 3; consult the website for exact details.

Course evaluation:

Assignments	20%
Midterm	20%
Presentation	20%
Final	40%

Preliminary lecture schedule for Math 3TP3

1. Week 1, Jan. 7 - 10, some historical context; read chapters 1 - 3 of Smith's book
2. Week 2, Jan. 14 - 17, more history zeroing in on Hilbert's problem;
3. Week 3, Jan. 21 - 24, some basic arithmetic; read chapters 4 - 5
4. Week 4, Jan. 28 - 31, some basic logic; read chapters 6 - 8
5. Week 5, Feb. 4 - 7, Peano arithmetic and primitive recursion; read chapters 9 - 12
6. Week 6, Feb. 11 - 14, PA and PR cont'd; read chapters 13 - 15, **midterm, in-class, Feb. 14**
7. Week 7, Feb. 25 - 28; a little more history; read chapters 16 - 18
8. Week 8, Mar. 3 - 6, Q and primitive recursion; read chapters 10, 11, 14
9. Week 9, Mar. 10 - 13, Godel numbering and the first incompleteness theorem; read chapters 15 - 17
10. Week 10, Mar. 17 - 20, first incompleteness theorem cont'd; read chapters 19 - 23
11. Week 11, Mar. 24 - 27, Diagonalization and Godel's second incompleteness theorem; read chapters 24, 31 - 32
12. Week 12, Mar. 31 - Apr. 7, Turing machines and the halting problem; read chapters 41 - 43, **in-class presentations**

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

Important Proviso

I reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites during the term and to note any changes.

Requests for Relief for Missed Academic Term Work

For absences from classes lasting up to 3 days: Using the McMaster student absence form (MSAF) on-line, self-reporting tool, undergraduate students may report absences lasting up to 3 days and may also request relief for missed academic work. The submission of medical or other types of supporting documentation is normally not required. Students may use this tool to submit one request for relief of missed academic work per term. Students must immediately follow up with their course instructors regarding the nature of the relief. Failure to do so may negate the opportunity for relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

For absences from classes lasting more than three days:

Students who are absent more than five days cannot use the on-line, self-reporting tool to request relief. They **MUST** report to their Faculty Office to discuss their situation and may be required to provide appropriate supporting documentation. If warranted, students will be approved to use a discretionary version of the MSAF on-line, self-reporting tool.

Late Withdrawal

McMaster University provides a Late Withdrawal option to assist students who have become irretrievably behind in a course. Students who have fallen behind with assignments and/or are not prepared to write final examinations (or equivalent) in one or more courses are encouraged to make use of this option and must contact their Academic Advisor in the Faculty/Program Office. Students will work with their Academic Advisor to discuss the situation and what steps they can take to prevent a recurrence.

The maximum number of units for which students may request a Late Withdrawal is 18 units throughout their undergraduate degree. Students may request a Late Withdrawal, without petition, no later than the last day of classes in the relevant Term. However, it is important to note that: requests for Late Withdrawal cannot be made in courses for which the final exam (or equivalent) has been attempted or completed. This also includes courses where a final grade has been assigned (e.g. clinical courses). Such requests will be cancelled or revoked if it is determined that the student attempted or completed the final exam (or equivalent). Students cannot use the Late Withdrawal option for courses in which they are under investigation or for which they have been found guilty of academic dishonesty.

Course(s) approved for Late Withdrawal will be:

- Assigned a non-numeric grade of LWD, in lieu of an alpha/numerical grade

- Excluded from the calculation of the GPA

- Ineligible for tuition refund

Approval of a late withdrawal is final, and requests to be re-enrolled in the withdrawn course(s) will not be considered. A withdrawal will not preclude students from enrolling in the course(s) in a subsequent term.

