

18.01 SYLLABUS, FALL 1999

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Classes. Class meets Tuesdays and Thursdays at 1:00, and Fridays at 2:00 in 3-370.

Recitations. Recitations meet Monday & Wednesday or Tuesday & Thursday. Times are posted on the door of 2-108. To change sections, go to 2-108.

Text and supplementary notes. The main text is *Calculus with Analytic Geometry, 2nd Edition* by George F. Simmons, McGraw-Hill. You are also required to purchase a copy of *18.01 Supplementary Notes and Problems*. The Supplementary Notes may be purchased at Graphic Arts, Room 11-004, from 8am–8pm Monday through Friday (during September they are also open on Saturday). These notes contain many of the assigned homework exercises and solutions.

The 18.01 web page. You will need to be able to access the course web page. You can find it on the MIT web at <http://web.mit.edu/18.01>. Most of the course materials will be distributed via the web page. Inside the Athena computing environment you can access the material easier (without downloading) in the locker 18.01 at `/afs/athena/course/18/18.01` and, after using the command `attach 18.01`, at `/mit/18.01` for the most convenience.

The 18.01 mailing list. Every 18.01 student is required to subscribe to the mailing list `18.01-students` on athena since it will be used to announce any important changes in schedules or information available on the web page. To subscribe log into Athena and use the command `mailmaint` (menu 5). `18.01-students` is intended for “one-way information exchange” only, it is no discussion list.

Administrative Matters. All handouts will appear on the course web page, and I hope you will pick them up there. A few printed copies of the handouts will be placed on the left wall in room 2-108. Please check the web page frequently. The web page is your main source for the homework assignments, copies of old exams, and other notices.

I will try and post important notices outside of 2-108, in the hallway, to the right as you enter the room. If you have questions about homework, exams, or grades, see your recitation instructor. For all other administrative matters, consult the Undergraduate Mathematics Office (UMO) room 2-108, 253-1258.

Your Grade. There are 5 main units in the class. For each unit there is an exam worth 100 points and a homework assignment worth 50 points. There is also a final exam worth 250 points, making a total of 1000 points. In order to pass the course you must both pass the final exam, and earn a sufficiently high cumulative total. The “passing mark” for your cumulative total depends on the performance of the class as a whole, so I can not give you an exact figure right now. I will assign a passing score to each in-class exam so you should have a good idea of where you stand throughout the term.

Homework. There are five problem sets: one for each of the first five units of the course. These will be posted to the web page a week or so before they are due. You will turn in your homework in room 2-106 by 1:45pm on the Friday on which it is due. Late homeworks will be marked “late” with time received. Multiple lateness may be taken into account in evaluating final grades.

Exams. There will be five 50-minute exams during the regular lecture hour on 9/24, 10/12, 10/28, 11/12, and 12/2. *The first exam will take place in 3-370 and 54-100, the remaining exams will take place in Walker.* If you fail an exam you will have two opportunities to retake it. See the section on *tutored exams* below.

Excused Absences. If you miss an exam due to illness, present a valid excuse to the UMO and arrange for a make-up exam in room 2-108. Members of sports teams who will miss exams need to inform the UMO in advance.

Tutoring. Tutoring is available Mondays through Thursdays in room 2-102 from 3:00pm to 5:00pm and 7:30pm to 9:30pm.

Tutored Exams. You can remedy a failed in-class exam, by taking a *tutored exam*. Most of the time tutored exams are worth at most the minimum passing grade for the original in-class exam. If you had an excused absence for an in-class exam you may make it up by taking a tutored exam. In this case the exam is worth up to 100 points. The tutored exams will be offered the week following the in-class exams. The schedule will be posted to the web page, as well as outside 2-108.

UNIT 1: DIFFERENTIATION

The exam for unit 1 will be held in 3-370 and 54-100 on Friday, September 24th.

- WR 9/8,9 Recitation: Graphing functions. Read Notes G (§§1-4).
- R 9/9 Lecture 1: Velocity and rates of change. Read §§2.1–2.4. It will be assumed that you already know the material in Chapter 1. Skim it, and refer back to it when necessary.
- F 9/10 Lecture 2: Slope and derivative, limits and continuity. Read Notes C. Learn the proof that “differentiable implies continuous.”
- T 9/14 Lecture 3: Differentiation formulas: products and quotients. Read §§3.1-3.2
- R 9/16 Lecture 4: Chain rule and implicit differentiation. Read §3.3 and §3.5.
- F 9/17 Lecture 5: Higher derivatives, exponential and log functions. Read §§3.6, 8.1, 8.2 (we are jumping ahead in the book since you need the exp, log and trig functions early in your science courses).
- T 9/21 Lecture 6: Calculus of the exponential and log functions. Read §8.3 (omit examples 2,3) and §8.4 (through example 1).
- R 9/23 Lecture 7: Trigonometric functions. Read §§9.1, 9.2, and 9.4 (through example 1 only).
- F 9/24 UNIT 1 EXAM

UNIT 2: APPLICATIONS OF DIFFERENTIATION

The exam for unit 2 will be held in Walker on Tuesday, October 12th.

- T 9/28 Lecture 8: Approximations. Read Supplementary Notes §A.
- R 9/30 Lecture 9: Curve sketching. Read §§4.1 and 4.2.
- F 10/1 Lecture 10: Max-min problems. Read §§4.3 and 4.4.
- T 10/5 Lecture 11: Related Rates. Read §4.5.
- R 10/7 Lecture 12: More max-min problems .
- F 10/8 Lecture 13: Inequalities, zeros, and Newton’s method. Read §4.6 and §2.6 pp 76–77 (you might also wish to read Supplementary Notes MVT).
- T 10/12 UNIT 2 EXAM

UNIT 3: INTEGRATION

The exam for unit 3 will be held in Walker on Thursday, October 28th.

- R 10/14 Lecture 14: Differentials and indefinite integration. Read §§5.1-5.3.
- F 10/15 Lecture 15: Definite integrals. Read §§6.1-6.4.
- T 10/19 Lecture 16: The fundamental theorem of calculus. Read §§6.5 and 6.6.
- R 10/21 Lecture 17: Changing variables and the second fundamental theorem. Read Supplementary Notes PI, §6.7, and Supplementary Notes FT.
- F 10/22 Lecture 18: Differential equations and separation of variables. Read §5.4 and §8.5.
- T 10/26 Lecture 19: Numerical integration and review of Unit 3. Read §10.9.

- R 10/28 UNIT 3 EXAM

UNIT 4: APPLICATIONS OF INTEGRATION

The exam for the 4th unit will be held in Walker on Friday, November 12th.

- F 10/29 Lecture 20: Areas between curves and volumes by slices. Read §§7.1-7.3.
- T 11/2 Lecture 21: Volumes by shells and average values. Read §7.4 and Supplementary Notes AV.
- R 11/4 Lecture 22: Parametric equations and arclength. Read §17.1 and §7.5.
- F 11/5 Lecture 23: Surface area and polar coordinate graphs. Read §7.6 and §§16.1-16.3.
- T 11/9 Lecture 24: Area and arclength in polar coordinates Read §§16.4 and 16.5.
- R 11/11 Veteran's Day Vacation.
- F 11/12 UNIT 4 EXAM

UNIT 5: INTEGRATION TECHNIQUES

The exam for the 5th unit will be held in Walker on Thursday, December 2nd.

- T 11/16 Lecture 25: Inverse trig functions and hyperbolic functions. Read Supplementary Notes G.7-G.9, §9.5, and §9.7.
- R 11/18 Lecture 26: Integration by direct substitution; trigonometric integrals. Read §§10.1-10.3.
- F 11/19 Lecture 27: Integration by inverse substitution; completing the square. Read §§10.4 and 10.5.

The technique of substitution has to do with applying the identity

$$\int f(g(x))g'(x)dx = \int f(u)du, \quad u = g(x).$$

Direct substitution changes the left-hand integral to the right-hand integral. *Inverse substitution* changes the right-hand integral to the left-hand integral.

- T 11/23 Lecture 28: Integration by partial fractions. Read §10.6 and Supplementary Notes F.
- RF 11/25,26 Thanksgiving Vacation.
- T 11/30 Lecture 29: Integration by parts; reduction formulas. Read §§10.7 and 10.8.
- R 12/2 UNIT 5 EXAM

UNIT 6: OTHER TOPICS

- F 12/3 Lecture 30: Indeterminate forms and L'Hospital's rule. Read §§12.1-12.3.
- T 12/7 Lecture 31: Improper integrals. Read §12.4 and Supplementary Notes INT.
- R 12/9 Lecture 32: Infinite series. Read §§13.1-13.3.