



Faculty of Science
DEPARTMENT OF MATHEMATICS AND STATISTICS
Course Information Sheet

1. **Course:** MATHEMATICS 253 - Calculus II Fall 04
Lecture/Time/Session: (M253) L02 MWF 12:00 ENA 101
Instructor: K.W. Chang
Office: MS 426 Phone: 220-6301

2. **Prerequisites:** Mathematics 249 or 251 or Applied Mathematics 217
NOTE: The Faculty of Science policy on pre- and co-requisite checking is outlined in the current University Calendar (see www.ucalgary.ca/pubs/calendar) *Faculty of Science, section 5C*. **It is the students' responsibility to ensure that they have the pre- and co-requisites for the course, and if they do not they will be withdrawn from the course without notice.**
3. **Fee policy:** After the last day to drop/add courses, there will be no refund of tuition fees if a student withdraws from a course, courses or the session.
4. **The University policy on grading and related matters** is described in the current University Calendar, *Academic Standings*. In determining the overall grade in the course, the following weights will be used:

Mid-term Test	20%	
Quizzes	30%	[Best 4 out of 5]
Final Exam	50%	

A passing grade on any particular component of the course is essential to passing the course as a whole. There will be a final examination scheduled by the Registrar's Office.

5. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are outlined in the current University Calendar, *Faculty of Science, section 6A*. It is the student's responsibility to familiarize herself/himself with these regulations.
6. **Academic misconduct** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the current University Calendar under the heading *Student Misconduct*.
7. **Dates and times of class exercises held outside of class hours (evening tests, Saturday laboratory examinations, weekend field trips, etc.):** ****There will be no out-of-class-time activities.****

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a conflict with this out of class time activity, please inform your instructor at least one week in advance of the activity so that other arrangements may be made for you.

8. Text: Calculus, Early Transcendentals, 5th edition, by James Stewart.

9. In addition to the instruction provided by their lecturer and tutorial instructor, there is a continuous tutorial available where students may obtain individual help with questions about the course material and exercise problems. Faculty members and graduate students will be available in the continuous tutorial room to answer questions in a one-to-one fashion. The continuous tutorial will be held in MS 365 on Mondays, Tuesdays, Wednesdays, and Thursdays from 11:00-15:00, and Fridays from 11:00-14:00. These continuous tutorial and regularly scheduled labs shown on student timetables are the only tutorials for this course sponsored by the Department of Mathematics and Statistics. Tutorial and help sessions for which there is a fee are NOT sponsored by the Department and the Department is not responsible for their content, which is sometimes erroneous.

10. There will be five quizzes of approximately 30 minutes duration which will be held in the labs. The mid-term test will be on **WEDNESDAY, OCT 20, 2004**.

11. The use of a calculator up to the level of a TI83 will be allowed on all tests and quizzes.

DETAILED SCHEDULE -- INTEGRATIONS ARE FUNDAMENTAL IN THIS COURSE.

Week	Date	Topic	Text Reference	Events
1	Sep 08	Inverse functions	1.5	
2	Sep 13	Fundamental Theorem Integration by substitution	5.3 5.5	
3	Sep 20	Integration by parts Trigonometric Integrals	7.1 7.2, 7.3	QUIZ 1
4	Sep 27	Partial fractions Numerical integration	7.4 7.7	Review 7.5
5	Oct 04	Improper integrals Applications	7.8 8.1	QUIZ 2
6	Oct 11	Applications	8.2, 8.3	Oct 11 - Thanksgiving Day
7	Oct 18	Differential Equations	9.1	MID-TERM EXAM - Oct 20
8	Oct 25	Differential Equations	9.1, 9.3	QUIZ 3
9	Nov 01	Differential Equations	9.4, 9.5	
10	Nov 08	Differential Equations	9.6, 9.7	QUIZ 4
11	Nov 15	2 nd Order Differential Equations	17.1	Nov 11 - Remembrance Day
12	Nov 22	2 nd Order Differential Equations	17.2	QUIZ 5
13	Nov 29	2 nd Order Differential Equations Topics	17.3	
14	Dec 06	Review		

A SHORT TABLE OF INDEFINITE INTEGRALS

I. Basic Functions

- | | |
|---|---|
| 1. $\int x^n dx = \frac{1}{n+1}x^{n+1} + C, \quad n \neq -1$
2. $\int \frac{1}{x} dx = \ln x + C$
3. $\int a^x dx = \frac{1}{\ln a}a^x + C$
4. $\int \ln x dx = x \ln x - x + C, \quad x > 0$ | 5. $\int \sin x dx = -\cos x + C$
6. $\int \cos x dx = \sin x + C$
7.(a) $\int \tan x dx = -\ln \cos x + C$
7.(b) $\int \cot x dx = \ln \sin x + C$
7.(c) $\int \sec^2 x dx = \tan x + C$
7.(d) $\int \csc^2 x dx = -\cot x + C$ |
|---|---|

II Products of e^x , $\cos x$, and $\sin x$

8. $\int e^{ax} \sin(bx) dx = \frac{1}{a^2+b^2}e^{ax}[a \sin(bx) - b \cos(bx)] + C$
9. $\int e^{ax} \cos(bx) dx = \frac{1}{a^2+b^2}e^{ax}[a \cos(bx) + b \sin(bx)] + C$
10. $\int \sin(ax) \sin(bx) dx = \frac{1}{b^2-a^2}[a \cos(ax) \sin(bx) - b \sin(ax) \cos(bx)] + C, \quad a \neq b$
11. $\int \cos(ax) \cos(bx) dx = \frac{1}{b^2-a^2}[b \cos(ax) \sin(bx) - a \sin(ax) \cos(bx)] + C, \quad a \neq b$
12. $\int \sin(ax) \cos(bx) dx = \frac{1}{b^2-a^2}[b \sin(ax) \sin(bx) + a \cos(ax) \cos(bx)] + C, \quad a \neq b$

III. Product of Polynomial $p(x)$ with $\ln x$, e^x , $\cos x$, $\sin x$

13. $\int x^n \ln x dx = \frac{1}{n+1}x^{n+1} \ln x - \frac{1}{(n+1)^2}x^{n+1} + C, \quad n \neq -1, \quad x > 0$
14.
$$\begin{aligned} \int p(x)e^{ax} dx &= \frac{1}{a}p(x)e^{ax} - \frac{1}{a} \int p'(x)e^{ax} dx \\ &= \frac{1}{a}p(x)e^{ax} - \frac{1}{a^2}p'(x)e^{ax} + \frac{1}{a^3}p''(x)e^{ax} - \dots \\ &\quad (+ - + - \dots) \quad (\text{signs alternate}) \end{aligned}$$
15.
$$\begin{aligned} \int p(x) \sin ax dx &= -\frac{1}{a}p(x) \cos ax + \frac{1}{a} \int p'(x) \cos ax dx \\ &= -\frac{1}{a}p(x) \cos ax + \frac{1}{a^2}p'(x) \sin ax + \frac{1}{a^3}p''(x) \cos ax - \dots \\ &\quad (- + + - - + + \dots) \quad (\text{signs alternate in pairs after first term}) \end{aligned}$$
16.
$$\begin{aligned} \int p(x) \cos ax dx &= \frac{1}{a}p(x) \sin ax - \frac{1}{a} \int p'(x) \sin ax dx \\ &= \frac{1}{a}p(x) \sin ax + \frac{1}{a^2}p'(x) \cos ax - \frac{1}{a^3}p''(x) \sin ax - \dots \\ &\quad (+ + - - + + - - \dots) \quad (\text{signs alternate in pairs}) \end{aligned}$$

IV. Integer Powers of $\sin x$ and $\cos x$

$$17. \int \sin^n x dx = -\frac{1}{n}(\sin^{n-1} x) \cos x + \frac{n-1}{n} \int \sin^{n-2} x dx, \quad n \text{ positive}$$

$$18. \int \cos^n x dx = \frac{1}{n}(\cos^{n-1} x) \sin x + \frac{n-1}{n} \int \cos^{n-2} x dx, \quad n \text{ positive}$$

$$19. \int \frac{1}{\sin^m x} dx = \frac{-1}{(m-1)} \frac{\cos x}{\sin^{m-1} x} + \frac{m-2}{m-1} \int \frac{1}{\sin^{m-2} x} dx, \quad m \neq 1, \quad m \text{ positive}$$

$$20. \int \frac{1}{\sin x} dx = \int \csc x dx = \ln[\csc x - \cot x] + C$$

$$21. \int \frac{1}{\cos^m x} dx = \frac{1}{(m-1)} \frac{\sin x}{\cos^{m-1} x} + \frac{m-2}{m-1} \int \frac{1}{\cos^{m-2} x} dx, \quad m \neq 1, \quad m \text{ positive}$$

$$22. \int \frac{1}{\cos x} dx = \int \sec x dx = \ln[\sec x + \tan x] + C$$

$$23. \int \sin^m x \cos^n x dx : \text{ If } m \text{ is odd, let } w = \cos x. \text{ If } n \text{ is odd, let } w = \sin x.$$

If both m and n are even and non-negative, convert all to $\sin x$ or all to $\cos x$ (using $\sin^2 x + \cos^2 x = 1$), and use IV-17 or IV-18. If m and n are even and one of them is negative, convert to whichever function is in the denominator and use IV-19 or IV-21. The case in which both m and n are even and negative is omitted.

V. Quadratic in the Denominator

$$24. \int \frac{1}{x^2+a^2} dx = \frac{1}{a} \arctan \frac{x}{a} + C, \quad a \neq 0$$

$$25. \int \frac{bx+c}{x^2+a^2} dx = \frac{b}{2} \ln|x^2+a^2| + \frac{c}{a} \arctan \frac{x}{a} + C, \quad a \neq 0$$

$$26. \int \frac{1}{(x-a)(x-b)} dx = \frac{1}{a-b} (\ln|x-a| - \ln|x-b|) + C, \quad a \neq b$$

$$27. \int \frac{cx+d}{(x-a)(x-b)} dx = \frac{1}{a-b} [(ac+d) \ln|x-a| - (bc+d) \ln|x-b|] + C, \quad a \neq b$$

VI: Integrands involving $\sqrt{a^2+x^2}$, $\sqrt{a^2-x^2}$, $\sqrt{x^2-a^2}$, $a > 0$

$$28. \int \frac{1}{\sqrt{a^2-x^2}} dx = \arcsin \frac{x}{a} + C$$

$$29. \int \frac{1}{\sqrt{x^2 \pm a^2}} dx = \ln|x + \sqrt{x^2 \pm a^2}| + C$$

$$30. \int \sqrt{a^2 \pm x^2} dx = \frac{1}{2} \left(x\sqrt{a^2 \pm x^2} + a^2 \int \frac{1}{\sqrt{a^2 \pm x^2}} dx \right) + C$$

$$31. \int \sqrt{x^2 - a^2} dx = \frac{1}{2} \left(x\sqrt{x^2 - a^2} - a^2 \int \frac{1}{\sqrt{x^2 - a^2}} dx \right) + C$$

RECOMMENDATION FOR SUCCESS

Students should attempt odd-numbered problems at the end of each section in the textbook. You are encouraged to get help from tutorial classes and continuous tutorial classes. You can also seek help during my office hours on Mondays and Wednesdays, 2:00-3:00 pm.; Tuesdays, 11:00 am - 12:00 noon.