

# Technical Calculus I, Spring 2012

## Basic Information

<b>Course</b>	Technical Calculus I, 2030:255–801 10055
<b>Time</b>	6:40–7:55 pm, TuTh, 1/10/2012–4/26/2012
<b>Location</b>	Polsky 418
<b>Text</b>	<i>Technical Calculus, Fifth Edition</i> Dale Ewen, Joan S. Gary, James E. Trefzger ISBN 0–13–048818–6
<b>Instructor</b>	Dr. Randby
<b>Office</b>	Polsky 133D (POL 133D), Associate Studies Department
<b>Office hours</b>	5–6 pm MW, 5–6:30 pm TuTh, or by appointment
<b>Phone</b>	(330)–972–6094
<b>E-mail</b>	<a href="mailto:srandby@uakron.edu">srandby@uakron.edu</a>
<b>Web Page</b>	<a href="http://srandby.org">http://srandby.org</a>

## Course Prerequisites

This course has a prerequisite: Technical Mathematics IV (2030:154) with a grade of **C-** or better or placement test. It is assumed that students in this course have an adequate understanding of the material covered in Technical Mathematics IV and its prerequisites.

## Course Objectives

After completing this course the student should have the following competencies: **(1)** the ability to calculate limits of functions, **(2)** the ability to identify the derivative as a particular kind of limit, **(3)** the ability to find the derivative of a function, **(4)** the ability to sketch the graph of a real-valued function by using derivatives, **(5)** the ability to recognize and solve technical problems by using differential calculus, and **(6)** the ability to find the integral of a function.

Course Content	
Chapter	Sections
2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.10
3	3.1, 3.2, 3.3, 3.5, 3.6, 3.7
4	4.2, 4.3, 4.5, 4.7, 4.8, 4.10
5	5.1, 5.2, 5.3, 5.4
7	7.1, 7.2, 7.3, 7.4, 7.5

## Grading Policies and Student Responsibilities

Course Components	
<b>Homework</b>	10 points/assignment
<b>Exams</b>	100 points/exam

### Attendance

- The official attendance policy of the university, as it appears on page 43 in the *Undergraduate Bulletin*, follows.

A student is expected to attend all class meetings for which the student is registered. A student may be dropped from a course in the current term by the dean if absence is repeated and the instructor recommends this action; a student can gain re-admission only with permission of both the instructor and the dean. A student dropped from a course receives an “F” which counts as work attempted whenever grade-point ratio calculations are made.

- Undergraduate Bulletin:  
[http://www.uakron.edu/academics\\_majors/undergraduate\\_programs/ugrad.pdf](http://www.uakron.edu/academics_majors/undergraduate_programs/ugrad.pdf)

- Attendance will be taken at the beginning of each class. Students who arrive late or leave early are counted as absent.
- Students are expected to attend every class, arrive to each class on time, and stay for the entire length of all classes.
- Students are responsible for all material covered in each class as the instructor does not give lectures outside of the classroom.
- Students are required to obtain notes and homework due date information from the course web site whenever they miss a class. Students should not expect classmates or the instructor to supply them with notes or other materials from the classes they miss.
- Students are not permitted to bring children, family members, friends, or any other person to class for any reason.

## Homework

- There will be a graded homework assignment, worth ten points, for each section covered in class. Homework counts towards 25% of your final grade. The due date for each graded assignment will be announced in class.
- The homework assignments for this course are contained in a PDF file which is posted on the course website. All students must download this file. It may either be viewed on a computer screen or printed out.
- Students are expected to turn in all homework assignments on time. A homework assignment is counted as late if it is not turned in by the end of class on the day it is due. Up to 10 points may be deducted from a late assignment.
- Students are required to complete all of the homework assignments. Each assignment which is not turned in reduces a student's final course grade by one full letter grade. If an assignment is turned in late, then it must be complete in order to be counted as turned in.
- The beginning of each class will be devoted to a discussion of homework problems. Success in a mathematics course requires sustained individual effort outside of the classroom. The minimal recommendation is that two hours of study-time are required for each hour of class-time.

## Exams

- Each exam is worth 100 points and will be based on the material previously covered in class. Exams count towards 75% of your final grade.

Exam Schedule	
1/26	Exam 1
2/23	Exam 2
3/22	Exam 3
4/12	Exam 4
5/1	Final Exam, 6-7:55 pm

- Students are required to take every exam during its scheduled date and time unless the instructor agrees to schedule a make-up exam. Make-up exams are given only under special circumstances. Early exams will not be given under any circumstances.

## Final Grades

- To determine your grade percentage use the following formula.

$h$  = the number of homework assignments

$e$  = the number of exams

$hw$  = the total number of homework points earned

$ex$  = the total number of exam points earned

$n$  = the number of assignments not turned in

$p$  = the grade percentage

$$p = hw \left[ \frac{25e + 2.5h}{10eh + h^2} \right] + ex \left[ \frac{7.5e + 0.75h}{10e^2 + eh} \right] - 10n$$

- To determine your course grade use the course grading scale given below.

	Grade		Grade
$91 \leq p \leq 100$	A	$71 \leq p < 77$	C
$90 \leq p < 91$	A-	$70 \leq p < 71$	C-
$87 \leq p < 90$	B+	$67 \leq p < 70$	D+
$81 \leq p < 87$	B	$63 \leq p < 67$	D
$80 \leq p < 81$	B-	$60 \leq p < 63$	D-
$77 \leq p < 80$	C+	$p < 60$	F

## Incompletes

- The official incomplete policy of the university appears on page 44 of the *Undergraduate Bulletin*.
- Students are expected to read and understand the official incomplete policy.
- Undergraduate Bulletin:  
[http://www.uakron.edu/academics\\_majors/undergraduate\\_programs/ugrad.pdf](http://www.uakron.edu/academics_majors/undergraduate_programs/ugrad.pdf)

## Withdrawal

- The official withdrawal policy of the university appears on page 43 of the *Undergraduate Bulletin*.
- Students are expected to read and understand the official withdrawal policy.
- The withdrawal deadline for this course is **Sunday, February 26, 2012**.
- Undergraduate Bulletin:  
[http://www.uakron.edu/academics\\_majors/undergraduate\\_programs/ugrad.pdf](http://www.uakron.edu/academics_majors/undergraduate_programs/ugrad.pdf)

## Course Website

- The address for the course web page is the following:

<http://srandby.org/2012.1/255.801/255.801.html>

- The course web page contains links to all the documents used in this course. It also contains a section entitled **Course News** in which information about each class meeting appears. Check with classmates, the syllabus, and the course web page before asking the instructor for non-mathematical information.

## Calculators

- All students are **required** to have a **graphing** calculator with minimum functionality equivalent to that of the **Texas Instruments TI-83** calculator.
- Every student is **required** to have possession of their calculator by the end of the first week of classes.
- Students are **required** to bring an acceptable calculator to each class.
- No exceptions to this policy will be made by the instructor.

## Office Hours

- My office hours are given above. You may come to my office anytime, not just during my office hours. If I am in my office when you arrive and I am not working on something urgent, then I will be happy to help you.
- Please note that office hours are for discussing homework problems, clarifying concepts discussed in class, and discussing general mathematical issues.

- I do not give make-up lectures during office hours nor will I discuss material that was covered in a class you missed and for which you have not obtained the notes as described above in the Attendance section.
- If you come to my office for help, please be sure to bring your class notes, any work you have done, a calculator, a writing instrument, and paper. If you lack any of these items, then you may be asked to go get them and come back later.

## Online Office Hours

- You may meet me online via the Elluminate collaboration software (now called Blackboard Collaborate).
  - First, go to the following link for instructions about setting up your system and using Elluminate:

**<http://support.blackboardcollaborate.com/ics/support/default.asp?deptID=8336&task=knowledge&questionID=1279>**

- Continuous support is available via the Elluminate Help Desk at the following phone number:

**866-388-8674 (option 2)**

- The address for the Elluminate office hours session is the following:

**<https://sas.illuminate.com/m.jnlp?password=M.80A7173664922F3BD34AE94889BF58&sid=2008366>**

So that I can determine who you are and which class you are in, your name should look like the following:

**Jane Doe - tc1**

- If you have made an appointment to meet with me online and do not show up to the meeting on time, then the meeting will be canceled. I suggest that you join the session at least 5 minutes before the scheduled start time so that you may set up audio and anything else you need to set up.
- Please be aware that I provide absolutely no technical support of any kind for Elluminate or any of the software required to run Elluminate. Please see above for technical support information.

## Tutoring

- Information about tutoring services is available at the following link:

**<http://www.uakron.edu/tutoring/>**

- Please note that I do not vouch for the quality, knowledge, or ability of any tutor on or off the campus.

## Conduct, Accessibility, Counseling, and Health Services

- Students are required to follow The University of Akron's *Code of Student Conduct*, and they are required to behave in a manner that complies with the expectations outlined in the *A Civil Climate for Learning: A Statement of Expectations* section of the *Undergraduate Bulletin* (page 7). The *Code of Student Conduct* is available on the website of the *Student Judicial Affairs* office.

- Undergraduate Bulletin:

**[http://www.uakron.edu/academics\\_majors/undergraduate\\_programs/ugrad.pdf](http://www.uakron.edu/academics_majors/undergraduate_programs/ugrad.pdf)**

- Student Judicial Affairs: **<http://www.uakron.edu/sja>**

- Students who require special services and/or accommodations in the course should submit a request to the *Office of Accessibility* in a timely manner. See the following link for more information:

**<http://www.uakron.edu/access/>**

- Currently enrolled students may obtain free psychological services at the *Counseling Center*. See the following link for more information:

<http://www.uakron.edu/counseling/>

- Currently enrolled students may obtain free or low cost health services at *Student Health Services*. See the following link for more information:

<http://www.uakron.edu/healthservices/>

## Formula Policy

### Pre-Course Formulas

The formulas that students are required to know by heart at the beginning of this course are listed below.

- $a^2 - b^2 = (a - b)(a + b)$
- $x^2 + (a + b)x + ab = (x + a)(x + b)$
- $acx^2 + (ad + bc)x + bd = (ax + b)(cx + d)$
- Let  $ax^2 + bx + c = 0$  where  $a, b,$  and  $c$  are constants with  $a \neq 0$ .

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

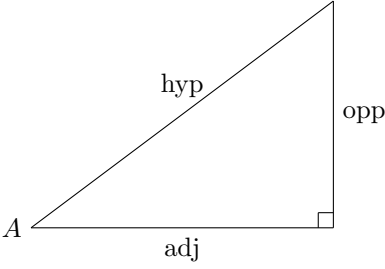
- Assume a line passes through  $(x_1, y_1)$  and  $(x_2, y_2)$  with slope  $m$  and  $y$ -intercept  $b$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad y = mx + b$$

- Let  $d$  be the distance between  $(x_1, y_1)$  and  $(x_2, y_2)$ .

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

- Suppose two lines have slopes  $m_1$  and  $m_2$  respectively. If the lines are parallel, then  $m_1 = m_2$ . If the lines are perpendicular, then  $m_2 = -\frac{1}{m_1}$ .

	$\sin(A) = \frac{\text{opposite of } A}{\text{hypotenuse}}$	$\csc(A) = \frac{1}{\sin(A)}$
	$\cos(A) = \frac{\text{adjacent of } A}{\text{hypotenuse}}$	$\sec(A) = \frac{1}{\cos(A)}$
	$\tan(A) = \frac{\text{opposite of } A}{\text{adjacent of } A}$	$\cot(A) = \frac{1}{\tan(A)}$

	$a^2 + b^2 = c^2$		$A + B = 90^\circ$
	$\sin(A) = \frac{a}{c}$	$\cos(A) = \frac{b}{c}$	$\tan(A) = \frac{a}{b}$
	$\csc(A) = \frac{c}{a}$	$\sec(A) = \frac{c}{b}$	$\cot(A) = \frac{b}{a}$
	$\sin(B) = \frac{b}{c}$	$\cos(B) = \frac{a}{c}$	$\tan(B) = \frac{b}{a}$
	$\csc(B) = \frac{c}{b}$	$\sec(B) = \frac{c}{a}$	$\cot(B) = \frac{a}{b}$
	$A = \sin^{-1}\left(\frac{a}{c}\right) = \cos^{-1}\left(\frac{b}{c}\right) = \tan^{-1}\left(\frac{a}{b}\right)$		
$B = \sin^{-1}\left(\frac{b}{c}\right) = \cos^{-1}\left(\frac{a}{c}\right) = \tan^{-1}\left(\frac{b}{a}\right)$			

<p>Angle <math>\theta</math> is shown below in standard position. Point <math>(x, y)</math> is a point on the terminal side of <math>\theta</math>, and <math>r</math> is the distance from <math>(0, 0)</math> to <math>(x, y)</math>.</p>	
	$r^2 = x^2 + y^2$ $\sin(\theta) = \frac{y}{r} \qquad \csc(\theta) = \frac{r}{y}$ $\cos(\theta) = \frac{x}{r} \qquad \sec(\theta) = \frac{r}{x}$ $\tan(\theta) = \frac{y}{x} \qquad \cot(\theta) = \frac{x}{y}$

- Factoring formulas

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

- Product formulas

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

$$(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b^3$$

- Exponents

$$a^{-n} = \frac{1}{a^n}$$

$$a^{m/n} = (\sqrt[n]{a})^m = \sqrt[n]{a^m}$$

- Radian measure

$$180^\circ = \pi \text{ radians}$$

- Let  $\theta$  be the radian measure of a central angle of a circle with radius  $r$ . Let  $s$  be the length of the circular arc intercepted by  $\theta$ , and  $A$  the area of the circular sector made by  $\theta$ .

$$s = r\theta$$

$$A = \frac{1}{2}r^2\theta$$

- Logarithms

$$\log_b(mn) = \log_b(m) + \log_b(n) \quad (m > 0, n > 0)$$

$$\log_b\left(\frac{m}{n}\right) = \log_b(m) - \log_b(n) \quad (m > 0, n > 0)$$

$$\log_b(m^n) = n \log_b(m) \quad (m > 0)$$

$$\log_b(b) = 1$$

$$\log_b(1) = 0$$

$$\log(m) = \log_{10}(m) \qquad \ln(m) = \log_e(m) \qquad \log_b(m) = \frac{\log_a(m)}{\log_a(b)}$$

- Fundamental Trigonometric Identities

$$\csc(x) = \frac{1}{\sin(x)} \qquad \sec(x) = \frac{1}{\cos(x)} \qquad \cot(x) = \frac{1}{\tan(x)} \qquad \tan(x) = \frac{\sin(x)}{\cos(x)} \qquad \cot(x) = \frac{\cos(x)}{\sin(x)}$$

$$\sin^2(x) + \cos^2(x) = 1 \qquad \sin(2x) = 2 \sin(x) \cos(x) \qquad \sin^2(x) = \frac{1 - \cos(2x)}{2} \qquad \cos^2(x) = \frac{1 + \cos(2x)}{2}$$

## Post-Course Formulas

The formulas that students are required to know by heart at the end of the course are listed below.

- Differentiation Formulas

$$\begin{aligned} \frac{d}{dx}(u^n) &= n u^{n-1} \frac{du}{dx} & \frac{d}{dx}(uv) &= u \frac{dv}{dx} + v \frac{du}{dx} & \frac{d}{dx}\left(\frac{u}{v}\right) &= \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \\ \frac{d}{dx}(\sin(u)) &= \cos(u) \frac{du}{dx} & \frac{d}{dx}(\cos(u)) &= -\sin(u) \frac{du}{dx} & \frac{d}{dx}(\tan(u)) &= \sec^2(u) \frac{du}{dx} \\ \frac{d}{dx}(\sec(u)) &= \sec(u) \tan(u) \frac{du}{dx} & \frac{d}{dx}(\csc(u)) &= -\csc(u) \cot(u) \frac{du}{dx} & \frac{d}{dx}(\cot(u)) &= -\csc^2(u) \frac{du}{dx} \\ \frac{d}{dx}(\sin^{-1}(u)) &= \frac{1}{\sqrt{1-u^2}} \frac{du}{dx} & \frac{d}{dx}(\cos^{-1}(u)) &= -\frac{1}{\sqrt{1-u^2}} \frac{du}{dx} & \frac{d}{dx}(\tan^{-1}(u)) &= \frac{1}{1+u^2} \frac{du}{dx} \\ \frac{d}{dx}(\ln(u)) &= \frac{1}{u} \frac{du}{dx} & \frac{d}{dx}(e^u) &= e^u \frac{du}{dx} \end{aligned}$$

- Integration Formulas

$$\begin{aligned} \int u^n du &= \frac{u^{n+1}}{n+1} + C \quad (n \neq -1) & \int \frac{1}{u} du &= \ln|u| + C & \int e^u du &= e^u + C \\ \int \sin(u) du &= -\cos(u) + C & \int \cos(u) du &= \sin(u) + C & \int \sec^2(u) du &= \tan(u) + C \\ \int \csc^2(u) du &= -\cot(u) + C & \int \sec(u) \tan(u) du &= \sec(u) + C & \int \csc(u) \cot(u) du &= -\csc(u) + C \\ \int \tan(u) du &= -\ln|\cos(u)| + C & \int \cot(u) du &= \ln|\sin(u)| + C & \int \sec(u) du &= \ln|\sec(u) + \tan(u)| + C \\ \int \csc(u) du &= \ln|\csc(u) - \cot(u)| + C \end{aligned}$$