

Math 162.06 Calculus II
Spring 2009

Time & Place: 162.06 MWF 1:15-2:30 Pardee 421, sometimes P219 on Monday

Text: James Stewart, *Calculus*, edition 6e

Instructor: Cliff Reiter

Office: Pardee 232

Office Hours: MW 2:40-4, F 2:40-3:30

Students are welcome to arrange to meet me for help at other times. I am also happy to help students who stop by anytime when I am not busy. I understand that sometimes you need help but aren't ready to ask "good questions". Meeting with me simply to discuss the material is just fine.

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Grading:

Exam 1	Wed	Feb	25	100 points
Exam 2	Wed	Apr	1	100 points
Exam 3	Wed	Apr	29	100 points
Final			_____	200 points

Quizzes: There will be seven 20 point quizzes scheduled: Feb 4, 11, 18, Mar 9, 25, Apr 13, 22. The lowest nonzero quiz score will be dropped. I reserve the right to give a 10 point quiz or class exercise at any class meeting without previous warning although I have done this very infrequently in the past.

Labs: We will typically do laboratories on about half of the Mondays with reports ordinarily due the following Friday. Feel free to discuss the labs with others, but the standard expectation is that reports are individual. Each lab report will usually be worth 10 points. Be alert as to whether you should go to lab or class each Monday.

Calculators: You may use a personal scientific calculator on quizzes and exams to do arithmetic. You may **not** use a calculator to graph, to store notes or to do symbolic calculus **nor may you share a calculator**. Labs are ordinarily graded on the merit of the lab report, but I reserve the right to deduct a severe penalty for gross misuse of lab time (unexcused absence, gaming/IM for the lab hour).

Goals: I expect you to achieve proficiency at the computational aspects of the calculus but I also expect you to gain experience with thinking about and applying the calculus to a variety of mathematical problems. The ability to switch back and forth between the algebraic calculus and geometric views is a principal skill I want you to develop.

Statement on Academic Honesty: The work you submit for purposes of evaluation in this course should be your own work. You must not seek nor accept help from anyone other than your instructor on exams and quizzes. You may discuss your laboratory work with other individuals (you should list them on your written reports) **but any writing of the laboratory report should represent your own work**.

Statement on Attendance: I expect you to attend class. You should not miss any graded exercise without discussing it with me ahead of time except in the most unusual circumstances. Missing an exam is a big deal and ordinarily requires a dean's excuse or the equivalent.

Suggested homework problems Additions and deletions are likely as the semester progresses. Ranges indicate "odds" in range unless otherwise noted. This list represents problems which I believe most students will find adequate for exercising their understanding of the material – if you find you are having difficulty, consider doing more problems, redoing problems until they become reflexive, rereading notes and the textbook, seeing me for help, talking to classmates about math (this is known to be a key predictor of success!), seeking help from the Calculus Cavalry or tutors. Please ask for advice if you need help but aren't sure which of those is most appropriate for you.

- §6.1 1-27, 49
- §6.2 1-11, 31-33, 41-43
- §6.4 3
- §6.5 3-7
- 6Rv 1-9, 30
- §7.1 *1, 5-8all, 9-15, 23-25, 37-41* *(note italic sections were covered in Calc I)*
- §7.2 *7-11, 17, 23-27, 31-41, 48, 73-81*
- §7.3 *3-17, 25-33, 37, 45-47, 55-59, 65*
- §7.4 *3-11, 15-17, 37, 45-49, 69-77*
- §7.5 3-5
- §7.6 1-7, 13, 23-31, 40, 43-45, 59-69
- §7.8 5-21, 27-31, 43, 45, 49, 53, 55, 87
- 7Rv 5-25, 33-35, 57, 63-67, 81, 93-101, 105
- §8.1 1-5, 11, 15-19, 23-25
- §8.4 1-17, 25, 29, 39
- §8.5 1-7, 11, 43, 47
- §8.7 17
- §8.8 1, 5-15, 21, 31
- 8Rv 1-3, 7, 15, 25, 41-43
- §9.1 7-13
- §10.1 1, 5, 7
- §10.2 1, 3-6all, 7, 13
- §10.3 1-5, 9, 11, 15
- §10.4 3, 5, 13
- §10.5 7
- 10Rv 1, 7, 9
- §11.1 5-15, 21, 24, 28, 33
- §11.2 1-7, 29, 37-39
- §11.3 1-11, 15-25, 29-41, 47
- §11.4 1-11, 17, 23, 27-31, 37
- 11Rv 1-3, 9, 17, 21, 33, 34
- §12.1 3-13, 17-25, 35-47, 61-65
- §12.2 3, 10, 11-25, 31, 47-51
- §12.3 3-7, 11, 17, 21-23
- §12.4 3-9, 13-19
- §12.5 1-13
- §12.6 1-9, 13-19, 31
- §12.7 1-19, 23, 27, 31-33
- §12.8 3-27 (ignore interval endpoint issues throughout the remainder of chapter 12)
- §12.9 3-9, 15-25
- §12.10 5-9, 13-17, 29-33, 51, 55, 63
- 12Rv 1-3, 11-15, 27-29, 41-43, 47-51, 57a

Cliff's Comments on *Mathematica* Labs

Your laboratory reports may take a variety of forms: written with focused answers, written with essay components, and labs that require discussion. Preparation of a good written lab report requires that you think about what you have done in the laboratory and connect it with the ideas of calculus. Your written reports will contain a variety of materials. Often there are a few short answers that can be given with a numeric value or a word. Other times a sentence or two is appropriate. Some of the written lab reports will require that you write some essay answers, others only require specific answers. You should be careful to write a report that answers the question you are asked in a way that makes clear how you discovered the information and how you interpreted it to come to your conclusion. Talk with your lab partner about what you are doing — this shouldn't just be when one of you is stuck. Talk to others in the class (note them on your written reports), the lab assistant and me, but be sure to write your own individual report.

For example, a fairly simple, but open ended Calculus one question might be "describe the main features of the function $f(x) = \frac{1}{x}\sin(x)$ ". You might use *Mathematica* to plot the function on the interval $[0,1]$, and then plot it on several other intervals. You may have decided that the function is: symmetric about the origin, undefined at the origin (with a limit of 1), has oscillations whose amplitude decreases away from the origin, and has horizontal asymptotes of zero. You would explain why you came to each of those conclusions. You could refer to the domain of the plots that you made, numeric values that you tested, like $f(0.001)$, and you might use L'Hopital's rule as a check on your claim about the limit. You likely would want to attach selective plots of the function on one or two of the most informative domains — but these attachments would represent only a small portion of your experiments. Note: the domain $[0,1]$ is lousy — it doesn't explore negative inputs, doesn't give a sense of what happens over a few periods of the function $\sin(x)$ and gives no clue as to what happens for bigger values in the domain, so a printout with the domain $[0,1]$ would not be an appropriate addition to your report. While it is natural and sometimes essential to include printouts of *Mathematica* results, it is usually not appropriate to hand in a printout of your entire *Mathematica* session. You should include attachments when they serve a purpose. Each figure or table requires a caption. (Be efficient and add annotations to printouts with a pen). Make sure that a reader can look at the attachment alone and answer the question: what information is conveyed by this attachment? Is it a plot of a certain function? What function? Is it a printout of an algebraic formula? What formula? The reader should be able to look at the report as a whole and see the purpose of including the attachment.

When lab reports require discussion, you are not required to write a description of your conclusions, but you must be prepared to describe and defend your conclusions. That will often require that you print out key evidence supporting your explanations and conclusions so that you can verbally present them to me. I encourage you to give oral reports with your lab partner or another classmate. You may give them alone, but not in a group of more than two. Usually reports will be due on the following Monday at the beginning of class. There likely will be exceptions around break and when there are unusual labs.

Much of the work that you do in the laboratory is straight forward — but keep your eyes open for those questions that make you pause to think. Have some fun experimenting. Try out your ideas.

***Mathematica* Laboratory Hours, Expected Spring 2008, (Pardee 219)**

Sunday	2:00-10:30
Mon/Tue/Wed/Thurs	4:00-10:30

Mathematica Syntax and Command Summary:

Shift-Enter executes a command you have typed

Constants: E, Pi, I

Arithmetic: Plus +, Minus -, Times *, Divide /, Power ^, Factorial !

Common Math Functions: Abs[x], Sqrt[x], Exp[x], Log[x], Sin[x], Cos[x], ArcSin[x]

Brackets:

(3+2)*5 Parentheses modify the order of execution
Sin[Pi/3] Square brackets are used for function arguments
a[[1]] Double square brackets specify data at a position. Here, the first position in a list.
{2,3,8} Lists appear in set braces

Copulas:

n=3+4 The result of 3+4 is computed (it is 7) and stored with name n.
f[x_]=x^n Immediate assignment of a function f. The function is x^n even if n changes.
f[x_] := x^n Delayed assignment of function f. The function is x^n whose value changes when n does.
Clear[f,n] Clears the definitions associated with f and n
Remove[f,n] Same as clear, but the names are also removed from the symbol table

Algebra:

x^2+x+1==0 Double equals is used for writing an equation
Expand[(x+1)^10] Multiply out the factors
Factor[x^2-5x+6] Factors the polynomial
Solve[x^2==1,x] Solve the equation for the variable x.
Simplify[a] Attempts to find a simple algebraic expression for a

Rules:

x->t+1 Is the "rule" x is replaced by t+1
(x^2+3)/. {x->t+1} Applies the rule to the expression giving a quadratic in the variable t

Calculus

D[f[x],x] or f'[x] The derivative of f with respect to x.
D[f[x],{x,n}] The nth derivative f
Integrate[f[x],x] Antiderivate of f with respect to x
Integrate[f[x],{x,0,1}] The definite integral on the interval [0,1]

*Numerics:*f[t_

N[Pi/3,100] Gives π/3 to 100 significant figures. Default is 15 or so.
FindRoot[f[x]==0,{x,1.0}] Try to find a root of f[x] near 1.0

Tables: Table[{n,Pi/n,Sin[Pi/n]},{n,1,6}]

Makes a table giving integers from 1 to 6, π over the integer, and the sine of that.

Graphics:

Plot[Sin[x]/x,{x,0,1}] Plots the function on the domain for x running from 0 to 1;
Options: PlotRange->{-1,1} or PlotStyle->Red and PlotRange->All
Options are listed after required arguments;
e.g. Plot[Sin[x]/x,{x,0,1},PlotStyle->Red]

Plot3D[Sin[x+y],{x,0,9},{y,0,9}] Plot the surface.
Options: PlotPoints->50 forces at least 50 sample points in each input variable.

ParametricPlot3D[{x[s,t],y[s,t],z[s,t]},{s,0,9},{t,0,9}] gives a parametric plot

ContourPlot[f[x,y],{x,-1,1},{y,-1,1}] Makes a gray shaded contour plot
Options: Contours->20 uses 20 contours; Contours->{0,1} shows just the levels 0 and 1.
ContourShading->False shows just the contour curves, no shading inbetween.

Previous Output: % is the result of previous command executed; %n is the result of Out[n]