

Syllabus for SM121, SM121A
Calculus I
Fall Semester, 2009-2010

TEXT: *CALCULUS, Early Transcendentals*, Edition 6e by James Stewart

LESSON	SECTION	TOPIC	PROBLEMS
1 (review)	App B	Coordinate Geometry & Lines	p. A15: 1,6,9,13,21,26,30,31,47,53,60
2 (review)	App D	Trigonometry	p. A32: 3,8,13,23,24,37,39,59,67, WAVE LAB
3	1.1	Representing functions	p. 20: 2,5,7,9,18,19,23,32,40,49,57,64
4	1.2	Math models: essential functns	p. 34: 3,6,9,10,13,17,19,20
5	1.3	New functions from old	p. 43: 2,3,4,10,11,14
6	1.3	(continued)	p. 44: 26,27,30,33,42,50,51,55
7	1.5	Exponential functions	p. 58: 4,7,11,13,15,18,21,25, PARACHUTE LAB
8	1.6	Inverse functions	p. 70: 1,3,4,7,8,10,18,19,21,24,30
9	1.6	Inverse logs and trig functions	p. 71: 23,33,35,38,47,48,58,59,63,67
10		Review	
11		Test 1	
12	2.1	Tangent and velocity	p. 87: 2,3,5,6,7, TOWER LAB
13	2.2	Limit of a function	p. 96: 1,4,7,8,12,19,25,34,40
14	2.3	Limit laws	p. 106: 1,2,3,5,10,13,14,17
15	2.3	(continued)	p. 107: 22,34,42,45,46,58
16	2.5	Continuity	p. 128: 1,2,3,6,8,17,37,47,48,60
17	2.6	Limits at infinity	p. 140: 1,2,3,6,11,18,20,41,55,58
18	2.7	Derivatives and rates of change	p. 150: 1,3,7,11,14,17,18,20
19	2.7	(continued)	p. 151: 25,30,31,34,39,41,46,51
20	2.8	Derivative as a function	p. 162: 2,3,4,5,9,14,21&24(Proofs),35,41, RADAR LAB
21		Review	
22		Test 2	
23	3.1	Derivatives of polynomials	p. 180: 4,6,7,10,15,17,24,30,31,37,51,58
24	3.2	Product and quotient rules	p. 187: 1,4,6,9,18,23,33,44,47,55
25	3.3	Trig derivatives	p. 195: 1,2,6,8,16,18,19
26	3.3	(continued)	p. 195: 21,26,34,35,39,40
27	3.4	Chain rule	p. 203: 1,2,7,12,13,15,36,41,49
28	3.4	(continued)	p. 204: 56,62,63,65,66,74,81,89,90(Proof)
29	3.5	Implicit differentiation	p. 213: 2,7,14,15,22
30	3.5	(continued)	p. 214: 26,47,50,66
31	3.6	Derivatives of logs	p. 220: 2,3,5,8,23,26
32	3.6	(continued)	p. 220: 28,33,37,42,45
33	3.7	Rate of change	p. 230: 1,6,10,11,15,17,33,35
34	3.9	Related rates	p. 245: 3,11,17,18, RATES LAB
35	3.9	(continued)	p. 246: 20,21,27,30,38
36	3.10	Linear approximations	p. 252: 3,45,10,24,25,43
37		Review	
38		Test 3	

39	4.1	Max and min values	p. 277: 1,2,4,5,7,12,22,31
40	4.1	(continued)	p. 278: 38,43,47,50,52,55
41	4.2	Mean Value Theorem	p. 285: 7,11,13,18,34
42	4.3	Derivatives and shapes	p. 295: 2,6,7,9,16, Prove the Increasing Test
43	4.3	(continued)	p. 295: 19,25,28,31,34,45,64
44	4.4	Indeterminate forms(L'Hospital)	p. 304: 1,2,5,8,11,15
45	4.4	(L'Hospital's Rule continued)	p. 304: 20,31,40,46,52,59
46	4.5	Summary of curve sketching	p.314: 2,5,9,11
47	4.5	(continued)	p.314: 19,29,31,46
48	4.7	Optimization problems	p. 328: 1,4,10,11,17
49	4.7	(continued)	p. 329: 20,30,31,33,44
50	4.9	Antiderivatives	p. 345: 1,10,15,23,27,47,50,52,74
51	5.1	Areas and Distances	p.364: 2,4,7,12,15,19, DECK LAB
52	5.2	The Definite Integral	p.376: 1,5,8,19,16,34,37,49
53	5.3	The Fundamental Thm of Calc	p.387: 3,7,11,13,20,22, FTC applet
54	5.3	The Fundamental Thm of Calc	p.387: 26,29,30,31,32,38,42,43
55	5.4	Indefinite Integrals	p.397: 2,3,9,12,20,30,35,62
56		Review	
57		Test 4	
58		Review for Final Exam	
59		Review for Final Exam	
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NOTES:

A web site at <http://www.usna.edu/MathDept/website/local/courses/fall2009.html> will have the most up to date information about the course, including this syllabus, practice exams, web links, and especially the online labs which appear in the homework assignments (also at the site http://www.usna.edu/MathDept/website/local/courses/calc_labs/labs.html).

- Three proofs are assigned in the syllabus -- at least one of them will be asked for on the final exam. The goal is for students to participate in the rigorous justification of a few mathematical concepts, thereby gaining a better appreciation of that aspect of mathematics and a better understanding of those concepts. The proofs are:
 - Proving the formula for the derivative of a quadratic or root from the definition as in Lesson 20, Section 2.8, exercises 21 or 24.
 - Proving the quotient rule using the product rule and chain rule as in Lesson 28, Section 3.4, exercise 90.
 - Proving the Increasing Test, Lesson 42, Section 4.3, page 287.
- If you would like help in the course, you should contact your instructor for extra-instruction. If your instructor is not available, try the **Math Lab** in CH130. It is staffed all six class periods every class day with instructors who should be able to answer your questions. Also see the Midshipmen Group Study Program (MGSP) for group study in the evening led by upper classmen.

3. A few copies of the text and student study guides have been put on reserve at the Nimitz circulation desk.
4. You are the first class to be issued laptops – it will take a while to see how to best integrate their use into calculus – your instructor will provide guidance for your section.
5. Exercises that ask for verbal explanations should be answered with complete sentences.

CALCULATOR NOTES

All students in this course are expected to have a calculator like the VOYAGE 200 with the capabilities to do symbolic calculations. There will be assignments that use such a calculator as well as questions on the common final exam on which it is expected that the student has such a calculator. The above web site also has a link to a file with a list of the minimal competences expected of all students.

The latest version of the VOYAGE 200 guidebook in PDF format is at

http://education.ti.com/guidebooks/graphing/89ti/Voyage200Guidebook_Part2_EN.pdf

Appendix D: Note, for example, that `tExpand(sin(x+y))` gives the sum formula. One way to change from degrees to radians is to enter 2nd D (for degrees) in radian mode. One way to reverse is to use 2nd Y D D (decimal degrees).

1.1 Be sure you can define your own functions on the calculator, either by define or store. (Piecewise functions are hard to enter - beyond the course expectations.)

1.3 Use the calculator to compose functions. Sometimes $g(f(x))$ will give an error. It can be avoided by defining f and g using a variable other than x (say t) but then using x for the composition. Try drawing shifted and stretched graphs with the calculator. In the $Y=$ screen, F4 unchecks/checks a function to not draw/draw it and F3 may be needed to edit (change) a function or clear and re-enter it.

1.4 Using $Y=$, GRAPH, TABLE gives a function algebraically, visually, and numerically. If a graph is taking too long to draw, the ON key interrupts. Zoomdec (F2 4) gives correct aspect ratio - makes circles circular.

To get roughly Figure 6, change the xmin/xmax window to plus or minus a)15, b)12.5, c)11.25, d)7.5.

To get Figure 11, try $x^{(1/3)}$ - note decimal point

2.1 All the many points in a problem like number 3 can be done quickly by defining a secant slope function on the calculator. For example, define $f(x)$ then use $f(x)|x=\{.5,.9,.99,.999\}$. Old assigned variables can cause errors - recommend using single letter variable names and then erasing with F6.

2.2 The VOYAGE 200 takes limits! For example define $g(x)=x/x$. Then $g(0)$ is undefined. But $\lim(g(x),x,0)=1$. And it does one sided limits, e.g. $\lim(\text{abs}(x)/x,x,0,-7) = -1$ (where -7 can be replaced by any negative) for limit from the negative side.

2.3 Graph the floor (called greatest integer function in the text but floor on the Voyage 200) and ceiling functions and understand in what way the calculator graphs are wrong.

2.6 Graph functions with infinite limits and understand how the calculator graphs can be wrong (drawing vertical asymptotes). The VOYAGE 200 can use (2nd J) for infinity in taking limits at infinity.

2.7 The VOYAGE 200 will draw tangent lines and give the equation (graph and then use F5 math A).