

# Math 107 Syllabus & HW - Fall 2006

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**Instructor:** Fernando Schwartz

**Office Hours:** Thursdays 2-4pm or by appointment. Room 225 Physics Bldg.

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**Course description:**

Systems of linear equations, matrix operations, vector spaces, linear transformations, orthogonality, determinants, eigenvalues and eigenvectors, diagonalization, linear differential equations and systems with constant coefficients and applications, computer simulations. Intended primarily for engineering and science students.

**Textbook:**

Linear algebra and differential equations, by Gary L. Peterson and James Sochacki. Published by Addison Wesley, ISBN 0-201-66212-4.

**Daily coverage and homework:**

Lesson	Topic(s)	Section(s)	Page / Homework
1	systems of linear equations	1.1	15 / 2,8,15,18,19,22,23,26,28 16 / 30 (intro to Matlab) <i>Additional Problem 1</i>
2	matrices and matrix operations	1.2	26 / 5,9,11,12,14,18,20,21,23,28-30,37
3	inverses of matrices	1.3	36 / 1,6,7,10,11(b),13,14,16,26
4	special matrices; determinants	1.4 & 1.5	41 / 4,12,17,20,22(c),24(d),26,32,33 50 / 5,8,12,15,16
5	proofs and applications	1.6	57 / 4,6,10,11,13,15(c),16,17
6	proofs and applications	1.7	64 / 5-7
7	linear independence in $\mathbb{R}^n$	2.3	93 / 1-3,6
8	<b>Exam 1 - Thursday 9/21</b>		
9	vector spaces; subspaces	2.1 & 2.2	73 / 2,3,9 81 / 1(c,d),2(b,d),3(c),5,11-13,21,22
10	linear independence; dimension	2.3 & 2.4	93 / 7,10,14,17,21,24,25,27,28,32 104 / 2,3(a,b),4(c,d),7,10,14,18,21,26
11	Wronskians	2.5	110 / 5-8,12,14,16
12	intro differential eqns	4.1	188 / 2,3,6,10,11,15,17,24 119 / 1,4,7

lesson	topic(s)	section(s)	page / homework
<b>Fall Break 10/7-10</b>			
13	homogeneous CCLDE (i)	4.2	201 / 2,5,23 <i>Additional Problems</i> 2 and 3
14	CCLDE (ii); undeterm coeff	4.2 & 4.3	201 / 7,10-13,20,22,24,29,30,37,40-42 211 / 1,4,9,11,18,36
15	applications (i)	4.5	228 / 5-8,11,13
16	applications (ii)	4.5	228 / 1,3,15,16,18
17	<b>Exam 2 - Thursday 10/26</b>		
18	linear transformations	5.1	243 / 3,4,7,12,13,18,20,33,35,36
19	algebra of LT	5.2	252 / 6,11,14,18,20,23
20	matrices; eigenvalues	5.3 & 5.4	267 / 1,5,7,9,17 277 / 5,8,9,16,17,20,26,32
21	similar matrices, Jordan	5.5	277 / 32 (is A diagonalizable?) 286 / 5,8,9,16,17,21,24,30,31,36,40
22	systems of LDE	6.1	301 / 1,4,5,9,17,27,28
23	constant coeffs diag; nondiag	6.2 & 6.3	311 / 3,5,11,15,22,25,28,30 314 / 3,17
24	nonhomogeneous systems	6.4	318 / 1,5,11,13,15
<b>Thanksgiving 11/22-26</b>			
25	converting eqns	6.5 & 6.6	322 / 4,5,13 331 / 2,4,11,15
26	<b>Exam 3 - Thursday 11/30</b>		
27	inner product spaces	9.1	419 / 6-8,12,16,18,20-22
28	orthonormal bases	9.2	429 / 2,6,9,13
<b>Block Final 12/14, 7-10pm</b>			

*Additional Problems.*

1. In parts (a) and (b) assume that the given system is consistent. For each system determine all possibilities for the numbers  $r$  and  $n - r$  where  $r$  is the number of nonzero rows of the (reduced) row echelon form of the augmented matrix and  $n$  is the number of the unknowns of the given system.

(a).  $Ax = b$  where  $A = [a_{ij}]_{3 \times 2}$ .

(b).  $Ax = b$  where  $A = [a_{ij}]_{3 \times 4}$ .

2. In each of the following write the given expression in the form  $a + ib$ :

(a)  $\frac{3+i}{4-5i}$ , (b)  $\exp(2 - 3i)$ , (c)  $e^{i\pi}$ , (d)  $e^{2-i\pi/2}$ , (e)  $2^{1-i}$ , (f)  $\pi^{1+2i}$ .

3. Solve each of the following equations:

(a)  $x^4 + 2x^2 + 1 = 0$ , (b)  $x^5 + 1 = 0$ .

## MATH 107 FALL 2006 – GRADES, HOMEWORKS AND EXAMS

Letter grades will be assigned only at the end of the semester, once the block final has been graded and a curve has been defined.

Your grade depends on the amount of points obtained throughout the semester.

There will be 3 tests, each worth up to 100 pts. Your homework score is the average of all but the worst assignment grade. It is worth up to 60 pts. The block final is worth up to 200 pts.

Homeworks are collected on a daily basis. Late homeworks are not accepted.

**Test grade revision is accepted only in written and within 1 week of the day you got your test back.**

For more information visit the course website at

*<http://www.math.duke.edu/~fernando>*