

MATH 107 SYLLABUS - SPRING 2006

0.1 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.

0.2 Textbook

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

0.3 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 Problems</i> 1 and 2 (see below)
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	Exam 1 - Tuesday 2/7		
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	2.2 & 2.3	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

Additional Problems. In each of the following exercises 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.

1. $Ax = b$ where $A = [a_{ij}]_{3 \times 2}$.
2. $Ax = b$ where $A = [a_{ij}]_{3 \times 4}$.

lesson	topic(s)	section(s)	page / homework
13	homogeneous CCLDE (i)	4.2	201 / 2,5,23 <i>Additional Problems</i> 3 and 4 (see below)
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	Exam 2 - Tuesday 3/7		
17	physical laws; applications (ii)	4.5	228 / 1,3,15,16,18
Spring Break 3/11 - 3/19			
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
25	converting eqns	6.5 & 6.6	322 / 4,5,13 331 / 2,4,11,15
26	Exam 3 - Tuesday 4/18		
27	inner product spaces	9.1	419 / 6-8,12,16,18,20-22
28	orthonormal bases	9.2	429 / 2,6,9,13

Additional Problems.

3. 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) π^{1+2i} .
4. Solve each of the following equations:
(a) $x^4 + 2x^2 + 1 = 0$, (b) $x^5 + 1 = 0$.

0.4 important dates

- Exams: 2/7, 3/7 and 4/18

- Final Block Exam: 5/1, 2-5pm