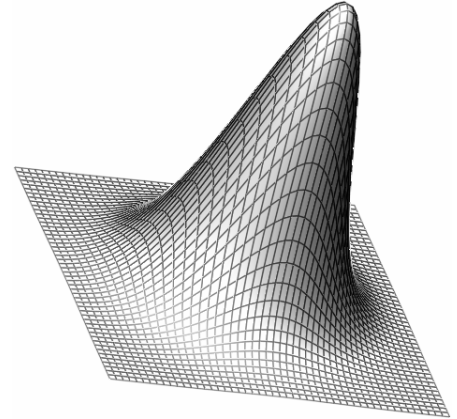


# Mathematical Methods For Physicists

(Phys 228-01)  
Spring 2008



**What am I doing here?** The main objective of this course is to help you develop skill with a variety of commonly used mathematical and numerical methods in physics in engineering. We will focus on the practical rather than the theoretical aspects of each technique, but there will naturally be some theory involved. The topics include derivatives and partial derivatives, infinite series (including Fourier series and Taylor series), vector calculus, complex numbers, linear algebra, tensors, differential equations, and probability. There will also be some examination of commonly used numerical techniques.

**What do I have to read?** The textbook is: *Mathematical Methods in the Physical Sciences*, by Mary Boas (3<sup>rd</sup> edition, Wiley). This book is very readable.

**How will I be graded?** Your grade will be determined by:

Assignments & quizzes:	40%
Exams (3 total):	<u>60%</u>
	100%

Final Exam: The final exam will be held on Monday, May 12, from 12:00 to 3:00pm, and will be comprehensive.

Assignments: Your homework solutions will be graded on clarity (a combination of neatness and completeness) and accuracy. Be warned: an answer is not the same as a solution. Assignments that are too hard to understand are also too hard to grade, and will receive zeroes. Unannounced quizzes may be given after assignments are due.

Some reminders about the **minimum** requirements for acceptable assignments:

- Use exactly  $8\frac{1}{2} \times 11$  inch paper. Do not use spiral ring paper. Use only one side of each sheet.
- Put your name and the assignment number on the top of each page.
- Staple your sheets together. No paper clips, or torn or folded corners.
- Use pencil, not pen. Erase mistakes instead of blotching them out.
- Work must progress linearly down the page. Recopy solutions that are too nonlinear.
- Be careful with symbol names. There may be more than one velocity in a problem, so they can't both be called " $v$ ". Use subscripts when needed.
- Use words and pictures to supplement your equations. Isn't that what *you* want when you read?
- Work symbolically rather than numerically whenever possible.
- Box your answers.

**What is the course schedule?** Here is a tentative schedule of topics for the semester:

Class	Date	Topic
1	Wed, Jan 23 or Fri, Jan 25	Infinite Series [Ch. 1]
2	Monday, January 28	Series II; Taylor series and approximations of derivatives [Ch. 1]
3	Wed, Jan 30 or Fri, Feb 1	Vector calculus I: dot, cross, del, and grad [Ch. 6]
4	Monday, February 4	Vector calculus II: divergence, curl, Laplacian [Ch. 6]
5	Wed, Feb 6 or Fri, Feb 8	<b>Numerics:</b> Plotting with MathCAD
6	Monday, February 11	Derivatives/Chain rule [Review/Ch. 4]
7	Wed, Feb 13 or Fri, Feb 15	Complex analysis I [Ch. 2]
8	Monday, February 18	Complex analysis II [Ch. 2]
9	Wed, Feb 20 or Fri, Feb 22	<b>Numerics:</b> General computing with MathCAD
<b>10</b>	<b>Monday, February 25</b>	<b>Exam #1 (covers classes 1-8)</b>
11	Wed, Feb 27 or Fri, Feb 29	Linear algebra I [Ch. 3]
12	Monday, March 3	Linear algebra II [Ch. 3]
13	Wed, Mar 5 or Fri, Mar 7	<b>Numerics:</b> Curve fitting
14	Monday, March 10	Eigenvalues & Eigenvectors [Ch. 3]
15	Wed, Mar 12 or Fri, Mar 14	Tensors [Ch. 10]
<i>Spring Break</i>		
16	Monday, March 24	Coordinate Transformations [Ch. 10]
17	Wed, Mar 26 or Fri, Mar 28	Multi-variable integration review with <b>Numerics</b> [Review/Ch. 5]
18	Monday, March 31	1 <sup>st</sup> order ordinary differential equations (separation of variables) [Ch. 8]
19	Wed, Apr 2 or Fri, Apr 4	2 <sup>nd</sup> order ordinary differential equations (constant coefficients) [Ch. 8]
<b>20</b>	<b>Monday, April 7</b>	<b>Exam #2 (covers classes 9-17)</b>
21	Wed, Apr 9 or Fri, Apr 11	<b>Numerics:</b> Differential equations (MathCAD RKadapt)
22	Monday, April 14	Fourier series I [Ch.7]
23	Wed, Apr 16 or Fri, Apr 18	Fourier series II & Fourier Transforms [Ch. 7]
24	Monday, April 21	Partial differential equations (heat equation) [Ch. 13]
25	Wed, Apr 23 or Fri, Apr 25	Partial differential equations (wave equation) [Ch. 13]
26	Monday, April 28	Probability: interpreting a pdf, counting, “choosing” [Ch. 15]
27	Wed, Apr 30 or Fri, May 2	Probability: common distributions (normal, binomial, poisson) [Ch. 15]
28	Monday, May 5	Statistics: standard deviation [Ch. 15]
<b>{29}</b>	<b>Monday, May 12</b>	<b>Final Exam (comprehensive)</b>