FINAL EXAM Study Guide

MA 166 · Spring 2022

1 Past Exams

Link to Past Exam Archive: https://www.math.purdue.edu/academic/courses/oldexams.php?course=MA16600

NOTES:

1. Prioritize taking exams from 2016-present.
2. Ignore problems with complex numbers and parametric equations.

2 Exam Material

The exam covers everything from the class: Lessons 1-34.

The exam will be in-person. It is a multiple-choice exam with a total of 25 questions. Your will have 2 hours to complete the exam. Details about the exam and a list of FAQ will be posted on the class website: https://www.math.purdue.edu/~kthood/MA166_Spring2022.html

3 How to Study:

1. Expand on the grid on the next page. Add the following:
    a. Relevant definitions
    b. Formulas – *making your own equation sheet is a good learning activity*
    c. Methods and Theorems
    d. Diagrams or plots
2. Return to your notes or the textbook to add any additional information that you feel will be useful for solving the types of problems listed in the grid
3. Solve the suggested practice problems. (This is not an exhaustive list. Just a suggestion for where to start)
4. Go to the Past Exam Archive (link above) and download exam 1 from a single semester.
    a. Take the exam. Treat it like a real exam. Set a timer and putting away your notes and calculator.
    b. Go to the solutions and grade your practice exam. Note the following:
        i. Which questions did you miss? – Rework them until you can answer them correctly.
        ii. Which topics from the grid did you do well on? Poorly on?
        iii. Is there a common type of mistake you are making?
        iv. Do you need to review your notes or the study guide?
    c. Repeat this process on another practice exam until you get a grade that you are happy with.

NOTE: If you want to practice the material by solving problems, you should prioritize solving the problems in this order:

1. Past Exam Archive (Multiple choice problems. Designed to not need a calculator)
2. Old Quiz problems
3. Old Homework problems
4. Additional Problems from the textbook

4 STUDY GRID

Less.	Sec.	You should be able to:	You should know:	Practice Problems
1	13.1 13.2	- Compute vector operations in 2D and 3D - Find magnitude of a vector - Find a position vector - Solve applications using vectors	Vector, magnitude, scalar, zero vector, position vector, unit vector, parallel	**13.1:** #21, 23, 28, 29, 43, 45
2	13.2 13.5	- Find the equation of a sphere, ball, or circle - Find the equation of a line - Find the equation of a plane	Sphere, ball, circle, plane, normal vector, parallel planes	**13.2:** # 29, 37, 45, 71 **13.5:** # 11, 15, 43, 45, 65
3	13.3	- Compute dot products - Find angles between vectors - Calculate orthogonal projections - Calculate work done in given situations	Dot product, orthogonal, orthogonal projection, work	**13.3:** # 35, 37, 47, 53
4	13.4	- Compute cross products - Find areas of parallelograms and triangles - Determine if points are collinear and/or coplanar - Find orthogonal vectors - Solve applications using the cross product - Find the intersection of 2 planes	Cross product, determinant, coordinate unit vectors (i, j, k), collinear, coplanar	**13.4:** # 13, 21, 27, 29, 33, 43,
5	6.2	- Answer conceptual questions involving regions between curves - Find the area between 2 curves	Integrating regions with respect to y	**6.2:** # 9, 12, 17, 39, 43
6	6.3	- Use the General Slicing Method to find volumes of solids - Use the Washer Method to find volumes of solids of revolution	General Slicing Method, Washer Method, solid of revolution	**6.3:** # 13, 17, 23, 25, 27, 37, 49, 53
7	6.4	- Use the Shell Method to find volumes of solids of revolution - Find volumes of solids of revolution using the appropriate method	Shell method	**6.4:** # 9, 10, 11, 12, 17, 19, 23
8	6.5 6.6	- Find arc lengths - Find functions with given arc lengths - Find surface areas of curves revolved around a given axis	Arc length, surface area, frustrum	**6.5:** # 11, 13, 15 **6.6:** # 7, 9, 11, 13

9	6.7	- Find the mass of thin bars with given density functions
		- Solve applications involving work, including:
		  - work done by a spring
		  - lifting problems
		  - pumping problems
		- Solve applications involving pressure and hydrostatic force
			Mass, density, work, Hooke's law, spring constant, hydrostatic pressure	**6.7:** # 13, 15, 23, 25, 31(a), 35, 37, 39(a), 46

10	8.2	- Evaluate integrals using Integration by Parts - Evaluate integrals using more than one iteration of Integration by Parts	Integration by Parts	**Sec 8.2:** # 3, 9, 11, 15, 23, 27, 33, 35, 37
11	8.3	- Evaluate integrals involving powers of sine and cosine - Evaluate trigonometric integrals	Half angle formulas	**Sec 8.3:** # 9, 11, 13, 15, 17, 19, 21, 23
12	8.3	- Evaluate integrals involving powers of tan(x) and sec(x) - Evaluate integrals of the form f(mx)g(nx) where f and g are sine or cosine	Derivatives of tan(x) and sec(x)	**Sec 8.3:** #27, 33, 35, 45, 53
13-15	8.4	- Evaluate integrals involving trigonometric substitution - Complete the square to solve integrals involving trigonometric substitutions	Reference triangle, Complete the square	**Sec 8.4:** #11, 13, 15, 19, 25, 27, 29, 61
16-17	8.5	- Find a partial fraction decomposition - Evaluate integrals involving partial fractions with: - simple linear factors - repeated linear factors - irreducible quadratic factors	Partial fraction decomposition, factoring	**Sec 8.5:** #5, 7, 9, 13, 23, 25, 29, 31, 33, 35, 51
18	8.9	- Evaluate improper integrals with an infinite limit of integration - Evaluate improper integrals with unbounded integrands - Use the comparison test to determine whether an integral converges or diverges	Evaluating limits, Comparison Test	**Sec 8.9:** #7, 9, 11, 13, 17, 23, 27, 37, 43, 45, 49, 51, 53
19	10.1, 10.2	- Find terms of a sequence - Determine the limit of a sequence	Recurrence relation, Squeeze Test, Growth Rates, L'Hôpital's rule	**10.1:** # 25, 35, **10.2:** # 15, 17, 19, 23, 25, 33, 37, 43, 46, 55, 75
20	10.1, 10.2	- Determine limits of sequences of partial sums - Evaluate Geometric series - Write repeating decimals as series and fractions - Evaluate Telescoping series	Infinite series, partial sums, Geometric series, Telescoping series	**10.3:** # 23, 25, 39, 37, 55, 61, 81, 83, 85
21	10.4	- Use the Divergence Test to determine whether a series diverges	Divergence test	**10.4:** # 9, 13, 14, 15, 27, 53, 58
22	10.4	- Use the Integral Test or p-Series Test to determine if a series converges - Estimate the value of a series	Harmonic series, p-series, Integral Test, p-series Test, remainder, upper bound, lower bound	**10.4:** # 20, 21, 22, 23, 29, 31, 55, 64(a)
23	10.5	- Use the Comparison Test or Limit Comparison Test to determine if a series converges	Comparison Test, Limit Comparison Test	**10.5:** # 11, 13, 15, 19, 23, 25, 27, 64

24	10.6	- Apply the Alternating Series Test - Determine the number of terms needed to ensure given errors for partial sums of alternating series - Determine if a series converges absolutely, conditionally, or diverges	Alternating Series Test, remainder of alternating series, absolute convergence, conditional convergence, Absolute Convergence Test	**10.6:** # 11, 14, 15, 21, 27, 33, 37, 45, 51, 53, 61
25	10.7	- Use the Root Test or the Ratio Test to determine if a series converges - Determine values for which a series converges	Ratio Test, Root Test	**10.7:** # 11, 13, 15, 21, 23, 25, 27, 35, 51
26	10.8	- Choose a test to determine whether a series converges or diverges		**10.8:** # 11, 15, 17, 25, 27, 39, 53, 69
27-28	11.1	- Find the Taylor polynomial for a function centered at a specified number - Find the remainder term of a Taylor approximation and use it to estimate error	Power series, Taylor polynomial, remainder, linear approximation, quadratic approximation	**11.1:** # 11, 15, 17, 23, 29, 43, 45, 55
29	11.2	- Find the interval and radius of convergence of power series - Write a power series representation of a given function	Interval and radius of convergence, combining power series	**11.2:** # 9, 11, 17, 23, 25, 27, 41, 43, 49
30	11.3, 11.4	- Find the Taylor/Maclaurin series and interval of convergence for functions - Find remainders for Taylor series - Evaluate limits using Taylor series	Maclaurin series, Convergence of Tailor series, Remainder, Limits by Tailor series	**11.3:** # 11, 13, 19, 27, 31, 37, 65 **11.4:** # 7, 9, 11, 13
31	11.2, 11.4	- Find a power series by integrating or differentiating a known power series - Write a power series of a given function -Find a function represented by a given power series - Approximate definite integrals using Taylor series	Integrating and differentiating power series	**11.2:** # 51, 53, 55, 57, 59, 67, 69, 71, 73 **11.4:** # 31, 37, 55, 57, 59, 61, 63
32	12.2	- Convert between polar and Cartesian coordinates - Convert between polar equations and Cartesian equations - Find alternate polar representations of polar points	Polar coordinates, equivalent points, equation of a line, equation of a circle	**12.2:** # 9, 11, 37, 39, 41, 47
33	12.2, 12.3	- Graph with polar coordinates - Find slopes and equations of tangent lines to polar curves	Slope of the tangent line	**12.2:** # 53, 57, 59, 63 **12.3:** # 11, 13, 15, 17
34	12.3	- Find the area of a region bounded by polar curves - Find the lengths of polar curves - Solve problems involving calculus in polar curves	Area integrals in polar coordinates	**12.3:** # 33, 35, 37, 39, 63, 65, 67, 69