MAT 296 Spring 2010. Final Exam: list of topics.

The numbers in parentheses indicate the sections where such problems, and methods of solution, are found. In addition, there are review problems at the end of each chapter of the textbook.

Techniques of integration

(1) Use u-substitution to evaluate an integral. (5.5)
(2) Use integration by parts to evaluate an integral. Does not include repeated integration by parts. (7.1)
(3) Use u-substitution and/or identities for $\sin^2 x$ and $\cos^2 x$ to integrate a combination of trigonometric functions (sin, cos, tan, and sec). Does not include $\int \sec x\, dx$ and $\int \sec^3 x\, dx$. (7.2)
(4) Given an integral with the square root of a quadratic polynomial, choose the appropriate trigonometric substitution and evaluate the integral. (7.3)
(5) Find the partial fraction decomposition of a given rational function. (7.4)
(6) Integrate partial fractions with denominators $x-a$, $(x-a)^k$, and x^2+a^2. (7.4)
(7) Recognize improper integrals of Type I and Type II. Demonstrate their convergence or divergence, and evaluate those that are convergent. (7.8)

Applications of calculus

(1) Find the area between Cartesian curves: vertical and horizontal slicing. (6.1)
(2) Find the volume of a solid by integrating the area of its cross-sections. (6.2)
(3) Find the volume of a solid of revolution: disks, washers, cylindrical shells. (6.2–6.3)
(4) Compute the work by integrating the product of force and distance (6.4)
(5) Find the average value of a function on an interval. (6.5)
(6) Find the length of a curve. (8.1)
(7) Find the area of a surface of revolution. (8.2)
(8) Convert between Cartesian and polar coordinates. Sketch a curve in polar coordinates. (10.3)
(9) Find the area bounded by one or two polar curves. (10.4)

Sequences and series

(1) Given a sequence, find its limit or determine that the limit does not exist. (11.1)
(2) Recognize a geometric series, determine its convergence/divergence and find the sum if convergent. (11.2)
(3) Determine if a series is convergent or divergent. (11.2–11.7)
(4) Determine if a series is absolutely convergent, conditionally convergent, or divergent. (11.2–11.7)
(5) Given a power series, find its Radius of Convergence and Interval of Convergence. (11.8)
(6) Know the power series for $\dfrac{1}{1-x}$, e^x, $\sin x$, and $\cos x$, and use them to represent a given function by a power series. (11.9–11.10)
(7) Find the Taylor/Maclauren series of f using the definition, $c_n = \dfrac{f^{(n)}(a)}{n!}$. (11.10)
(8) Use the power series representation of a function to integrate the function. (11.9–11.10).