MATH 19 FINAL TOPICS
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BROWN UNIVERSITY
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Note: you should have memorized the information in Appendix II at the end of the course notes.

All topics listed for Midterm I and Midterm II. The final is cumulative.

Interval of convergence. Be able to use the absolute convergence test plus ratio test to identify the radius of convergence of a given Taylor series. Test the endpoints if necessary to determine the interval of convergence. Be prepared to use the fact that the interval of convergence is symmetric about the center of the Taylor series.

Evaluating infinite sums using Taylor series. Use known Taylor series evaluated at specific values to find the values of infinite sums. Your main tools here will be the Maclaurin series for e^x and for $\frac{1}{1-x}$. Example: $\sum_{n=0}^{\infty} \frac{2^n}{n!}$. Answer: e^2.

Manipulating Taylor series Be able to obtain new Taylor series from known ones using addition, multiplication, differentiation, integration, or composition. Use the resulting Taylor series to extract information about derivatives of the function at the center: Example: What's the 33rd derivative of $\sin(x^4)$ at $x = 0$? Answer: there's no x^{33} term in the Taylor expansion $\sin(x^4) = x^4 - \frac{1}{6}x^{12} + \frac{1}{120}x^{20} - \cdots$, so $\boxed{0}$.

Fourier coefficients. Know how calculate real Fourier coefficients a_n and b_n of a 2π-periodic function and know how to calculate complex Fourier coefficients c_n. Be able to convert back and forth between the two using the relation $c_n = \frac{a_n - ib_n}{2}$ for $n > 1$.

Fourier convergence Know the Dirichlet-Jordan convergence theorem, particularly the part about convergence of Fourier series at a point where the function you're approximating jumps. Be prepared to apply Theorem 13.6 to differentiate a complex Fourier series.

Nonhomogeneous linear DEs using Fourier series Know the method developed in the solution of Example 13.8, wherein we discover that the circuit DE solution is obtained from the driving function by simply dividing each Fourier coefficient c_n of the driving function by $p(in)$, where p is the characteristic polynomial of the DE.