## Differential Equations and Special Functions

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- 1. Introduction; Vectors in Function Spaces
- 2. Vectors in Function Spaces, cont'd
- 3. Gram-Schmidt Orthogonalization
- 4. Operators
- 5. Self-Adjoint Operators
- 6. Series Solutions-Frobenius' Method
- 7. Series Solutions-Frobenius' Method, cont'd
- 8. Other Solutions
- 9. Homework Questions
- 10. Introduction to Sturm-Liouville Theory; Hermitian Operators
- 11. ODE Eigenvalue Problems
- 12. Generating Functions
- 13. Bessel Functions of the First Kind
- 14. Bessel Functions of the First Kind, cont'd
- 15. Orthogonality of Bessel Functions
- 16. Bessel Functions of the Second Kind
- 17. Spherical Bessel Functions
- 18. Spherical Bessel functions, cont'd
- 19. Legendre Polynomials
- 20. Orthogonality of Legendre Polynomials
- 21. Orthogonality of Legendre Polynomials, cont'd
- 22. Physical Interpretation of the Generating Function

- 23. Associated Legendre Equation
- 24. Associated Legendre Equation, cont'd
- 25. Spherical Harmonics

## Supplementary Materials:

- 1. Power series solutions 1: Leibniz method
- 2. Power series solutions 2: Frobenius method
- 3. When power series method fails for differential equations
- 4. Why power series solutions not good for singular differential equations

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