Ordinary Differential Equations

1. Exact forms Mdx+Ndy=0
2. 積分因子 積分因子(李群觀點)
3. Homogeneous nonlinear equations
4. Applications of first order eqtions
5. Linear second order equations $p(x)y''+q(x)y'+r(x)y=f(x)$
   (1) Homogeneous $ay''+by'+cy=0$ where a、b、c are constant $a\neq 0$

   The Wronskian and Abel formula

   (2) Nonhomogeneous linear equations $y''+p(x)y'+q(x)y=f(x)$
   $x^2y''+xy'-4y=2x^4$
   (3) The method of undetermined coefficients $ay''+by'+cy=e^{\alpha x}G(x)$
   (4) Riccati equations $y'+y^2+p(x)y+q(x)=0$ let $y=\frac{z'}{z}$
   (5) Reduction of order
   (6) Variation of parameters given $\{y_1,y_2\}$ let $y_p=u_1y_1+u_2y_2$
6. Applications of linear second order equations
   (1) Spring-mass system
   (2) RLC circuits
   (3) Motion of an object under a central force
7. Linear system $A'=Ax$ Abel 公式
8. Phase flows
9. Fundamental solutions of linear homogeneous equations
10. 冪級數解
11. Laplace Transform Gamma function
12. Legendre 與 Bessel 多項式
13. D'Alembert method
14. 正交曲線族 人造衛星的軌道方程 Escape velocity
15. 單擺 懸鍊線(catenary)
16. Green 定理的應用
17. ODE with discontinuous forcing function
18. The convolution integral(褶積)
19. Numerical Methods (1)Euler's method (2)Runge-Kutta method

習作 [Ex001]

1. Elementary Differential Equations and Boundary Value Problems William E. Boyce Richard C. DiPrima
2. Elementary Differential Equations and Boundary Value Problems William F. Trench [Student Solution Manual]
3. Ordinary Differential Equations V.I.Arnold
4. Symmetry Methods for Differential Equations Peter E. Hydon
5. Galois Theory of Linear Differential Equations Marius van der Put [ResearchGate]
6. 微分方程 劉睦雄 劉任業
7. 微分方程式 王振華
8. Solved Problems
