"ELIMINATION OF ARBITRARY CONSTANTS AND FAMILIES OF CURVES"

CHAPTER 1
ELIMINATION OF ARBITRARY CONSTANTS

1. $x^3 - 3x^2y = C$

$3x^2dx - 3x^2dy - 3y(2x)dx = 0$

$3x^2dx - 6xydx - 3x^2dy = 0$

divide by $3x$,

$xdx - 2ydx - xdy = 0$

$\therefore (x+2y)dx - xdy = 0$ ans.

2. $y\sin x - xy^2 = 0$

$y(\cos x\,dx) + \sin x\,dy - 2yx\,dy - y^2dx = 0$

$y\cos x\,dx - y^2dx + \sin x\,dy - 2xydy = 0$

$\therefore y(\cos x - y)dx + (\sin x - 2xy)dy = 0$ ans.

3. $x^2y = 1 + Cx$

$x^2dy + 2xydx = 0 + Cdx$

divide by dx,

$\frac{x^2dy}{dx} + 2xy = C$

Substitute,

$x^2y = 1 + \left[x^2\frac{dy}{dx} + 2xy\right]x$

$x^2y = 1 + x^3\frac{dy}{dx} + 2x^2y$

$x^2ydx = dx + x^3dy + 2x^2ydx$

$dx + x^3dy + 2x^2ydx - x^2ydx = 0$

$dx + x^3dy + x^2ydx = 0$

$\therefore (x^2y + 1)dx + x^3dy = 0$ ans.

4. $Cy^2 = x^2 + y$

$\frac{x^2+y}{y^2} = C$

$\frac{y^2[2xdx + dy] - [x^2+y]2ydy}{(y^2)^2} = 0$

$2xy^2dx + y^2dy - 2yx^2dy - 2y^2dy = 0$

divide by y,

$2xydx + ydy - 2x^2dy - 2ydy = 0$

$\therefore 2xydx - (2x^2+y)dy = 0$ ans.

(5) $x = A\sin(wt + \alpha)$; w is a parameter not to be elim.

$\frac{dx}{dt} = Aw\cos(wt + \alpha)$

$\frac{d^2x}{dt^2} = Aw[-w\sin(wt + \alpha)]$

$= -Aw^2\sin(wt + \alpha)$

but $x = A\sin(wt + \alpha)$

$\frac{d^2x}{dt^2} = -w^2x$

$\therefore \frac{d^2x}{dt^2} + w^2x = 0$ ans.

6. $x = C_1\cos wt + C_2\sin wt$

; w a parameter.

$\frac{dx}{dt} = C_1(-w\sin wt) + C_2(w\cos wt)$

$\frac{d^2x}{dt^2} = C_1w(-w\cos wt) + C_2w(-w\sin wt)$

$= -w^2(C_1\cos wt + C_2\sin wt)$

$\frac{d^2x}{dt^2} = -w^2x$

$\therefore \frac{d^2x}{dt^2} + w^2x = 0$ ans.

7. $y = Cx + C^2 + 1$

$y' = C + 0 + 0$; $\therefore C = y'$

$\therefore y = y'x + (y')^2 + 1$ ans.

8. $y = mx + \frac{h}{m}$; h a parameter, m to be eliminated.

$y' = m + 0$; $\therefore m = y'$

$\therefore y = xy' + \frac{h}{y'}$ ans.

9. $y^2 = 4ax$

$2ydy = 4adx$

$\therefore 4a = \frac{2ydy}{dx}$

Substitute,

$y^2 = \left(\frac{2ydy}{dx}\right)x$

$y^2dx = 2xydy$

$\therefore y^2dx - 2xydy = 0$ ans.

10. $y = Ax^2 + Bx + C$

$y' = 2Ax + B + 0$

$y'' = 2A + 0$

$y'' = 0$ ans.

Rainville Solution Manual

Ensheng Dong

Rainville Solution Manual:

Ordinary Differential Equations and Their Solutions George Moseley Murphy,2011-01-01 This treatment presents most of the methods for solving ordinary differential equations and systematic arrangements of more than 2 000 equations and their solutions The material is organized so that standard equations can be easily found Plus the substantial number and variety of equations promises an exact equation or a sufficiently similar one 1960 edition *The American Mathematical Monthly* ,1981 *Notices of the American Mathematical Society* American Mathematical Society,1981 Catalog of Copyright Entries. Third Series Library of Congress. Copyright Office,1967 Includes Part 1 Number 1 Books and Pamphlets Including Serials and Contributions to Periodicals January June **Low Back Pain** Ali Asghar Norasteh,2012-05-09 This book includes two sections Section one is about basic science epidemiology risk factors and evaluation section two is about clinical science especially different approach in exercise therapy I envisage that this book will provide helpful information and guidance for all those practitioners involved with managing people with back pain physiotherapists osteopaths chiropractors and doctors of orthopedics rheumatology rehabilitation and manual medicine Likewise for students of movement and those who are involved in re educating movement exercise physiologists Pilates and yoga teachers etc *Modeling with Differential Equations in Chemical Engineering* Stanley M. Walas,1991 Modelling with Differential Equations in Chemical Engineering covers the modelling of rate processes of engineering in terms of differential equations While it includes the purely mathematical aspects of the solution of differential equations the main emphasis is on the derivation and solution of major equations of engineering and applied science Methods of solving differential equations by analytical and numerical means are presented in detail with many solved examples and problems for solution by the reader Emphasis is placed on numerical and computer methods of solution A key chapter in the book is devoted to the principles of mathematical modelling These principles are applied to the equations in important engineering areas The major disciplines covered are thermodynamics diffusion and mass transfer heat transfer fluid dynamics chemical reactions and automatic control These topics are of particular value to chemical engineers but also are of interest to mechanical civil and environmental engineers as well as applied scientists The material is also suitable for undergraduate and beginning graduate students as well as for review by practising engineers Subject Guide to Books in Print ,1971 **Linear Differential Equations and Oscillators** Luis Manuel Braga da Costa Campos,2019-11-05 Linear Differential Equations and Oscillators is the first book within Ordinary Differential Equations with Applications to Trajectories and Vibrations Six volume Set As a set they are the fourth volume in the series Mathematics and Physics Applied to Science and Technology This first book consists of chapters 1 and 2 of the fourth volume The first chapter covers linear differential equations of any order whose unforced solution can be obtained from the roots of a characteristic polynomial namely those i with constant coefficients ii with homogeneous power coefficients with the exponent equal to the order of derivation The method of characteristic polynomials is also applied to iii

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