Reduction of Order

Ex Solve X y t 5 5 5y O given that y X X o

y ucxs.si 3 jII

In X'y t 5 5 55 0 X Ch xt2w t 5Xtixth 54 1 0

U X t 24 2 t 5h X t 54 544 0

X U t 7 24

X xn 747 0

o Xu t 7 u o w w X w t 7W o W u

w Ew dwTx Ew Gdf fZdx

huh 7h14 t co

x o bywf 7erxtcoqhlwl e vrxtc.tw eax ecolW X T eco

We IX 7 e Let G Ie i w Cx 7

w cx due CE dx Sdu Xx dx

U Cx tB Let A I

U AX b tB y y a U X faxbtB AX 5 t Bx www generalSolution

to DE

Reduction of Ordershortcut Cowethod 2

Form y t Porgy tQCxy o spandex Formula Yz y ge DX yfCx

Ex Solve X2y t 5Xy 55 0 y X

Y t 5X y 5k2y o Ya x e s dx XZ

x de

a dx

x x DX

X I6

6

tf Yz Y Ay t Byz Ax Bx s General

Solution

Ex Given that Y ex X 1 usetheReduction of order method is one solution to theDE GDy txy ty o

tofind a Secondsolution Leaveanswer as anintegral

Y t y t y yz e geez S o

dTT dx dx it dx Xthlx it exge exg e x 2x

n euckde Dtdo e2x x thx i exy e e 2x et d

3 3

Second Order LinearODE With Constant Coefficients

e.g y gyrtibyeo Auxiliary equation

y m2 m2 8Mt 16 0

y n M y I Case I Tworealrootsmi Mz Quad y Cen Czem equation Cage OnerepeatedrootMi Mz

ye cem tczxem2

case Complexconjugate a IIB

y ed ccostsx CzSinxD

Exi FindDenson to y 89 t164 0

MZ 8M 116 0 2 Cm 4 2 0 M 4,4

y C e t Czxe4 fundamental solutions are EH Xe t

Ex Solve y thy t5y o

m2 4Mt5 0 me 41725 2

Mi 2 r Fi r

ma 2 Ii Zz m 2 Ii Y e ccosCx tczs.inCx

Fundamental solutions e cosx e sinx

Higher OrderLinear ODE with constant Coeff

Ex Solve y t2g thy t8y o

m3t2m2t 4M18 0It I2 I4,18

M Z is a root thus Mtz is afactor

2 I 2 4 88 pity pm2 4 I 0 YOL W t2m21um18 Cmt2 math m 2 I 2i y ce t Czcosax t Sina fundamentalSuins arei e 4 CostaSin2x

EX Solve y 255 tgyu 4g toy 2y't y o

Hint Mb 2M t3M 4m t3M2 2Mt I Cm 1 2 m2 1 2

MI l I Ii Ii

y Cex tczxextcscosxtcnsinxtcgxcosxtcbxs.im

Fundamental Suns ex Xcx Cox Sioux Xcosx Xsinx

3 4 Non homogeneous linear ODE with constant coat

Poly XX I 2 An y t An Y t t A y t Aoy Generalsolution Y complementary yo d solution t yp particular solution therawform solutioncorresponding tothehomoequation

chosenbasedonis 9Cx gCx le CosineCosxcos3X

sineexexe

sinxsinsx

Combinationofabove Ex FindthegeneralSolution to y 5y'tby 3X

m2 Ya gmt6 b yo typ 0

M3Cm27 0 me2,3 YoI C e2xtCze3X

Yp isthemostgeneralform of gCx Yp AxtB I c

Constants CoettofXi 5A GA A t bB 3 I

O B

12

Yp IzX t IZ Iy c e t cae t IzX t Iz

Yc Yp