MTH303

Mathematical Methods

Formula Sheet

2 Chapters, 48 Formulas

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- p(t)
  - p(t) = 10a / (10b + (a – 10b)e-a(t-t0))

The mass-spring system equation
  - x" + (a / m) x' + (k / m)x = g + (F(t) / m)

- Differential equations
  y" + 9y = sin(t)

- with initial conditions y(0)
  - with initial conditions y(0) = 1, y'(2p) = -1

- y(t)
  - y(t) = (1/8) sin(t) + cos(3t) + sin (3t)

y" + p2y
  y" + p2y = 0

- with initial conditions y(0)
  - with initial conditions y(0) = 2, y(1) = -2

- y(t)
  - y(t) = 2cos(pt) + (c)sin(pt)

- an(t)y(n) + an-1(t)y(n-1) + . . . + a1y' + a0(t)
  - an(t)y(n) + an-1(t)y(n-1) + . . . + a1y' + a0(t)y = h(t)

x3(y"')3-x2y(y")2+3xy'+5y
  x3(y"')3-x2y(y")2+3xy'+5y=ex

-ln|1-t|
  -ln|1-t|=ln|x|+ln|c|

-ln|1-t|
  -ln|1-t|=1

(1-t) =xc
  (1- w) =xc

(1- y/x)
  (1- y/x) =xc

Example 3:

$(2y\,x-3)dx+(2yx+4)dy=0$

Solution: $(2y\,x-3)dx+(2yx+4)dy=0$

Here $M=(2y\,x-3)$

N

$N=(2yx+4)$

$=(2y\,x-3)$ and

f(x,y)

$f(x,y)=x\,y-3x+h(y)$

$y+h'(y)$

$y+h'(y)=2x\,y+4=N$

$h(y)=4y+c$

$x\,y-3x+4y=C$

Integrating

$ln|y|=ln|1+e$

$|+lnc$

$ln|y|=ln|c(1+e$

f(x,y)

$f(x,y)=e+y$

xcosx

$I.F=\exp(\int(\tan x+1/x)dx)=x\sec x$

Here p(x)

Here $p(x)=2/x$ And $Q(x)=x$

Integrate

$x\,u=2[x\ln x-x]$

$=2[x\ln x-x]+c$

$1\,dy+\ln y$

$1\,dy+\ln y=e$

I.F

I.F =exp(1/xdx)=x

Example 11:

+x+y+1=(x+y) e

I.F

I.F=exp(-dx)=e

d (e w)

d (e w)=-e

put 4x+y+1

put 4x+y+1=u

u

u=2tan(2x+c)

4x+y+1

4x+y+1=2tan(2x+c)

put x+y

put x+y =u

Example 14: 2y

+x +y +x=0

put x +y

put x +y =u

du -2x+u+x

du -2x+u+x=0

Integrating

e u=xe -e +c

Integrate

e =-cosx+c

u=ln|-cosx+c|

x+y=ln|-cosx+c|

3 dx

x du =2x -3

3 dx

du =6x -9/x

Integrate

u=2x -9lnx+c

x y

x y =2x -9lnx+c

x+c

x+c=v-tan 2

Good Luck!

Keep practicing!