People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research

University of Batna 2   Common Core of Science and Technology
Faculty of Technology   Engineering Section
Module: Calculus 2 (Analyse 2)

Tutorial Session N°2

Exercise n°1

Solve the following differential equations.

a. $\dfrac{d^2y}{dx^2} = \sin(2x)$ initial conditions $y(\pi) = 0,\ y'(\pi) = 1$

b. $\dfrac{d^4y}{dx^4} = 3x - 1$ initial conditions $y(0) = y'(0) = y''(0) = y'''(0) = 0$

Exercise n°2

Solve the following differential equations.

a. $y'' - 5y = 0$

b. $2\dfrac{d^2y}{dx^2} + 5\dfrac{dy}{dx} = 0$

c. $9y'' - 12y' + 4y = 0$

d. $y^{(5)} - 2y^{(4)} + y^{(3)} = 0$

e. $D^2(D + 1)^3(D - 2)(3D + 5)(2D - 3)y = 0$

f. $(D^3 - 11D^2 + 31D - 21)y = 0$

g. $(4D^3 - 24D^2 + 35D - 12)y = 0$

h. $y'' - 4y = 0$ initial conditions $y(0) = y'(0) = 4.$

i. $(D - 1)^2(D + 2)y = 0$ initial conditions $y(0) = y'(0) = 0,\ y''(0) = 9$

Exercise n°3

Solve the following differential equations.

a. $9y'' + y = 0$

b. $y^{(4)} - 16y = 0$

c. $(D^2 + 1)(D^2 + D + 1)y = 0$

d. $(D^2 + 4D + 5)^2y = 0$

e. $(D^3 - D^2 + 9D - 9)y = 0$

f. $(D^4 - 1)y = 0$

g. $(D^2 + 1)^4y = 0$

h. $16y'' + y = 0$ initial conditions $y(0) = 2 \quad y'(0) = 9$

Exercise n°4

a. Find the differential operator that annihilates the function
   $E(x) = 8e^x$

b. Find the annihilator of the function
   $E(x) = 6 - 8e^x$

c. Solve the following ordinary differential equations:

     c.i. $y'' - 2y' - 3y = 6 - 8e^x$

     c.ii. $(D^2 + 2D + 1)y = 5 + x$

     c.iii. $(D^2 - 4)y = -3e^{3x} + 10xe^{3x}$

     c.iv. $(D^2 + 1)y = \cos x$

     c.v. $(D^2 + 6D + 10)y = 80e^x \sin x$

Exercise n°5

Solve the following differential equations.

a. $(4D^2 - 4D + 1)y = x^{1/2}e^{x/2}$

b. $2y'' - 6y' + 4y = 6e^{2x}$

c. $(D^2 + 1)y = secx$

d. $x^2D^3 + 2xD^2 - 2D)y = x^3$