Mohamed Khider University of Biskra

Faculty of FSESNV
Department of SM
University Year 2025/2026

Module: Series and Diff. Eq
Level: 2nd Year LMD
Speciality: Physics

Dirigated Work N°4

(DIFFERENTIAL EQUATIONS)

Exercise 1 (Homogeneous linear equations of the 1st order) *Solve the following differential equations:*

$$1). \begin{cases} \acute{y} + 4y = 0 \\ y(0) = 2 \end{cases}$$

$$2). \begin{cases} x\acute{y} + (1+x)y = 0 \\ y(1) = 1 \end{cases}$$

$$3). \begin{cases} (1+x^2)\acute{y} - xy = 0 \\ y(0) = 1 \end{cases}$$

Exercise 2 (No homogeneous linear equations of the 1st order) *Solve the following differential equations:*

$$1). \begin{cases} x\acute{y} + y = x \\ y(2) = 0 \end{cases} \qquad 4). \begin{cases} \acute{y} + y = x\exp(-x) \\ y(0) = 1 \end{cases}$$

$$2). \begin{cases} x\acute{y} - 2y = x^4 \\ y(1) = 1 \end{cases} \qquad 5). \quad \acute{y} + 2y = x^2$$

$$3). \begin{cases} \acute{y} - 2y = \dfrac{-2}{1+\exp(-2x)} \\ y(0) = 2 \end{cases}$$

Exercise 3 (Linear equations with separate variables) *Solve the following differential equations:*

$$1). \begin{cases} 2x + y\acute{y} = 0 \\ y(1) = 1 \end{cases} \qquad 2). \begin{cases} \acute{y} = \dfrac{1-y}{1-2x} \\ y(0) = 0 \end{cases} \qquad 3). \begin{cases} (4-x^2)\,y\acute{y} = 2(1+y^2) \\ y(1) = 0 \end{cases}$$

Exercise 4 *Solve the following differential equation on $\mathbb{R}$:*

$$(1+x^2)\acute{y} + 2xy = e^x + x.$$

Exercise 5 (Homogeneous linear equations of the 2nd order) *Solve the following differential equations:*

1). $\ddot{y} + y = 0$ 2). $\ddot{y} - 4y = 0$ 3). $2\ddot{y} + \acute{y} - y = 0$ 4). $\ddot{y} - 6\acute{y} + 9y = 0.$

Exercise 6 (No homogeneous linear equations of the 2nd order) *Solve the following differential equations:*

1). $\ddot{y} + y = x^2 - 1.$ 2). $\ddot{y} - 4y = 13\cos(3x).$

3). $2\ddot{y} + \acute{y} - y = 3\cos(2x) - \sin(2x).$ 4). $\ddot{y} - 6\acute{y} + 9y = e^{3x}.$

Charged of courses

Dr. OUAAR, F