Week 01 and Week 02 Participation Assignment (1 of 4)

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Contents

1   Part 1

Directions: For the following differential equations (given along with the field or problem area in which it arises. FYI), 1) classify each as ordinary differential equation (ODE) or a partial differential equation (PDE); 2) give the order; 3) indicate the independent and dependent variables. 4) If the equation is an ordinary differential equation, indicate whether the equation is linear or nonlinear. (No calculation required)

1.1 $\frac{d^2x}{dt^2} - 2x\frac{dx}{dt} + 2y = 0$

1. ODE

2. Second-order equation

3. Independent Variable(s): t
   Dependent Variable(s): x

4. Linear

1.2 $\frac{dy}{dx} = \frac{y(2-3x)}{x(1-3y)}$

1. ODE

2. First-order equation

3. Independent Variable(s): x
   Dependent Variable(s): y

4. Nonlinear

1.3 $\frac{\partial N}{\partial t} = \frac{\partial^2 N}{\partial r^2} + \frac{1}{r}\frac{\partial N}{\partial r} + kN$, where k is a constant

1. PDE

2. Second-order equation

3. Independent Variable(s): t, r
   Dependent Variable(s): N

4. -

1.4 $\frac{dx}{dt} = k(4 - x)(1 - x)$, where k is a constant

1. ODE

2. First-order equation

3. Independent Variable(s): t
   Dependent Variable(s): x

4. Nonlinear

1.5 $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$

1. PDE

2. Second-order equation

3. Independent Variable(s): x, y, z
   Dependent Variable(s): u

4. -

1.6 $8\frac{d^4 y}{dx^4} = x(1 - x)$

1. ODE

2. Fourth-order equation

3. Independent Variable(s): x
   Dependent Variable(s): y

4. Linear

$$8\frac{d^4 y}{dx^4} = x(1 - x)$$

$$\left(\frac{8d^4}{dx^4}\right) y = -x^2 + x$$

which is in the form $Ly = f$ $\therefore$ linear