

Differential Equations — Assignment 1

Class 12 Maths · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Order and Degree

MCQ Questions (choose the correct option)

- The order of a differential equation is the order of the
 - highest derivative present
 - lowest derivative
 - function itself
 - independent variable
- The degree of a differential equation is the power of the
 - highest-order derivative
 - lowest derivative
 - constant term
 - independent variable
- The order of $\frac{d^2y}{dx^2} + 3 \frac{dy}{dx} + 2y = 0$ is
 - 2
 - 1
 - 3
 - 0
- The degree of $(\frac{dy}{dx})^3 + y = 0$ is
 - 3
 - 1
 - 2
 - 0

1 Mark Questions

- Define the order of a differential equation.
- Define the degree of a differential equation.
- Find the order of $\frac{d^2y}{dx^2} + y = 0$.

2 Mark Questions

- Find the order and degree of $\frac{dy}{dx} + y = x$.
- Find the order and degree of $(\frac{d^2y}{dx^2})^2 + y = 0$.

3 Mark Questions

- Find the order and degree of $\frac{d^2y}{dx^2} + (\frac{dy}{dx})^3 + y = 0$.
- Find the order and degree of $(\frac{d^3y}{dx^3})^2 + (\frac{d^2y}{dx^2})^3 = 0$.

Forming a Differential Equation

MCQ Questions (choose the correct option)

- A differential equation is formed by
 - eliminating arbitrary constants
 - differentiating constants
 - integrating constants
 - adding constants
- If there are n arbitrary constants, the order of the differential equation is
 - n
 - $n - 1$
 - $n + 1$
 - 1
- The family $y = mx$ represents
 - lines through the origin
 - circles
 - parabolas
 - exponentials
- To form a differential equation from $y = a \sin x$, we eliminate
 - a
 - x
 - $\sin x$
 - y

1 Mark Questions

- How is a differential equation formed?
- If a family has n arbitrary constants, what is the order of the differential equation?
- What family does $y = mx$ represent?

2 Mark Questions

- Form the differential equation from $y = mx$.
- Form the differential equation representing $y = a \cos x + b \sin x$.

3 Mark Questions

- Form the differential equation from $y = A e^{2x} + B e^{-2x}$.
- Form the differential equation representing all circles of radius r centered at the origin.

Variable-Separable Equations

MCQ Questions (choose the correct option)

- A variable-separable equation can be written as
 - $f(x) dx = g(y) dy$
 - $f(x) f(y) = 0$
 - $x = y$
 - $dy/dx = 0$
- The solution of $dy/dx = y/x$ is

- (A) $y = Cx$
 - (B) $y = C/x$
 - (C) $y = x^2 + C$
 - (D) $y = \ln x + C$
3. To solve $dy/dx = f(x)g(y)$, we
- (A) separate the variables and integrate
 - (B) differentiate again
 - (C) take logarithms
 - (D) square both sides
4. The general solution of $dy/dx = ky$ is
- (A) $y = C e^{kx}$
 - (B) $y = Cx$
 - (C) $y = kx + C$
 - (D) $y = C/kx$

1 Mark Questions

1. When can variables be separated in a differential equation?
2. Solve $dy/dx = y/x$.
3. Write the general solution of $dy/dx = ky$.

2 Mark Questions

1. Solve $dy/dx = x/y$.
2. Solve $dy/dx = 2x$.

3 Mark Questions

1. Solve $dy/dx = (1 + y^2)/(1 + x^2)$.
2. Solve $dy/dx = e^{x+y}$.

Homogeneous Equations

MCQ Questions (choose the correct option)

1. A homogeneous differential equation has the form $dy/dx =$
 - (A) $F(x/y)$ or $F(y/x)$
 - (B) $F(x)$
 - (C) $F(y)$
 - (D) constant
2. For homogeneous equations, we substitute
 - (A) $y = vx$
 - (B) $y = x + v$
 - (C) $x = v$
 - (D) $y = v/x$
3. The degree of homogeneity of $(x^2 + y^2)$ is
 - (A) 2
 - (B) 1
 - (C) 0

(D) 3

4. After substituting $y = vx$, the equation becomes

- (A) separable in v and x
- (B) constant
- (C) linear in y
- (D) trivial

1 Mark Questions

1. Define a homogeneous differential equation.
2. What substitution is used for homogeneous equations?
3. Find the degree of homogeneity of $x^2 + xy$.

2 Mark Questions

1. Solve $dy/dx = y/x + 1$ using $y = vx$.
2. Show that $dy/dx = (x + y)/x$ is homogeneous.

3 Mark Questions

1. Solve $dy/dx = (x + y)/(x - y)$.
2. Solve $(x^2 + y^2) dy/dx = 2xy$.

Linear Differential Equations

MCQ Questions (choose the correct option)

1. A linear differential equation of the first order has the form
 - (A) $dy/dx + P(x)y = Q(x)$
 - (B) $dy/dx = y^2$
 - (C) $y dy/dx = x$
 - (D) $(dy/dx)^2 = y$
2. The integrating factor for $dy/dx + P(x)y = Q(x)$ is
 - (A) $e^{\int P dx}$
 - (B) $\int P dx$
 - (C) $P(x)$
 - (D) $e^{\{P\}}$
3. The solution is obtained by multiplying by the
 - (A) integrating factor
 - (B) independent variable
 - (C) derivative
 - (D) constant
4. The integrating factor for $dy/dx + y = x$ is
 - (A) $e^{\{x\}}$
 - (B) x
 - (C) $e^{\{-x\}}$
 - (D) 1

1 Mark Questions

1. Write the standard form of a linear differential equation.
2. Write the integrating factor for $dy/dx + P(x)y = Q(x)$.
3. Find the integrating factor for $dy/dx + y = x$.

2 Mark Questions

1. Solve $dy/dx + y = e^{-x}$.
2. Solve $dy/dx + (1/x)y = x$.

3 Mark Questions

1. Solve $dy/dx + 2y = e^{-x}$.
2. Solve $x dy/dx + y = x^3$.