

## Differential Equations Assignment/Worksheet

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### 9. Differential Equations

**QUESTION 1:** Form the differential equation of the family of curves

$$y = A \cos 2x + B \sin 2x \text{ where } A \text{ and } B \text{ are constants.}$$

**QUESTION 2::** Solve the following differential equation:

$$x \cos y \, dy = (xe^x \log x + e^x) dx$$

**QUESTION 3.** Solve the following differential equation

$$(1 - x^2) \frac{dy}{dx} - xy = x^2$$

given  $y = 2$  when  $x = 0$

**QUESTION 4:** Show that the differential equation

$$2y e^{x/y} dx + (y - 2x e^{x/y}) dy = 0$$

is homogeneous and find its particular solution given that  $x = 0$  when  $y = 1$ .

**QUESTION 5:** Find the particular solution of the differential equation

$$\frac{dx}{dy} + y \cot x = 2x + x^2 \cot x, \quad x \neq 0$$

given that  $y = 0$ , when  $x = \pi/2$

**QUESTION 6:** Form the differential equation representing representing the family of ellipses having foci on x-axis and centre at origin.

**QUESTION 7:** Form the differential equation satisfied by

$$\sqrt{[1 - x^2]} + \sqrt{[1 - y^2]} = (x - y), \text{ a is an arbitrary constant}$$

**QUESTION 8:**

Solve the given differential equation :  $(x+1) \frac{dy}{dx} = 2e^{-y} - 1$

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### QUESTION 9:

Is  $y = x \sin 3x$  a solution of the given Differential equation  $\frac{d^2 y}{dx^2} + 9y - 6 \cos 3x$

### QUESTION 10

Solve the differential equation  $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$

### QUESTION 11:

Solve The given differential equation

$$dx + dy = \frac{dx - dy}{x - y}$$

### QUESTION 12:

Find the particular solution of  $\frac{dy}{dx} = \frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}; x \neq 0, y(2) = 1$

### QUESTION 13:

The bacterial population in a culture increases continuously at the rate proportional to the number of bacteria present at any time. If the bacterial population was 20,000 at the 1999<sup>th</sup> of the experiment and 25000 at 2004<sup>th</sup> sec, what will be the population of the village at 2009<sup>th</sup> second?

**QUESTION 14:** The general solution of the Differential equation

$$\frac{ydx - xdy}{y} = 0$$

### QUESTION 15:

Determine order and degree of differential equations given

$$\frac{d^4 y}{dx^4} + \sin(y''') = 0$$

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