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# Advanced Engineering Mathematics | (10th Edition)

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## Step-by-step solution

### Step 1 of 6

#### Ordinary Differential Equation (ODE):

A differential equation is said to be ordinary, if the derivatives in the equation are ordinary derivatives.

Example:

$$(1) \cdot \frac{dy}{dx} + (x-2)y = 0$$

$$(2) \cdot (x^2 + y^2)dx + (x^2 - y^2)dy = 0$$

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### Step 2 of 6

#### Partial differential equations (PDE):

A differential equation is said to be partial if the derivatives in the equation have reference to two or more independent variable.

Example:

$$(1) \cdot (y+2) \frac{\partial z}{\partial x} + (z+x) \frac{\partial z}{\partial y} = x+y$$

$$(2) \cdot \left( \frac{\partial z}{\partial x} \right)^2 + \left( \frac{\partial z}{\partial y} \right)^2 = 3z$$

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### Step 3 of 6

#### Order of a differential equation:

A differential equation is said to be of order 'n' if the n th derivative is the highest derivative in that equation.

Example:

$$(1) \cdot (x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2$$

Order of this DE is 1

$$(2) \cdot x \frac{d^2y}{dx^2} + (2x-1)y \frac{dy}{dx} + (x-1)y = 0$$

Order of this DE is 2.

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The solution of a differential equation in which the number of arbitrary constants is equal to the order of the differential equation is called the general solution.

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**Step 5 of 6**

Particular solution:

If particular values are given to the arbitrary constant in the general solution, then the solution so obtained is called particular solution.

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**Step 6 of 6**

Initial value problem (I. V. Ps.)

An ordinary differential equation together with an initial condition  $y(x_0) = y_0$ , is called an initial value problem

Example:

(1)  $\frac{dy}{dx} = 3y,$

with initial condition  $y(0) = 1$

(2)  $\frac{dy}{dx} + 4y = 2,$

with initial condition  $y(0) = 2$

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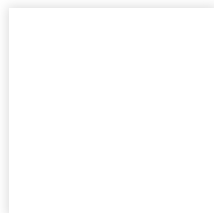
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**Chapter 1.R, Solution 13P**

Given equation of ODE in  
Integrate on both sides

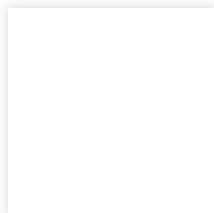
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**Chapter 1.R, Solution 23P**

Given equation of ODE is  
With initial value

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