$d/dx\,(y) + xy = y \mathbin{\char`\^} 2 * (x \mathbin{\char`\^} 2)/(c \mathbin{\char`\^} 2) \text{ Sin } 2x$

1 / 1

This is a first-order linear differential equation that can be solved using the method of integrating factors. First, we rearrange the equation to get y' by itself on the left-hand side:

$$d/dx\,(y) = y^2 * (x^2)/(c^2) * \sin(2x) - xy$$

Next, we multiply both sides by an integrating factor, which is defined as e^(int(-x dx)) = e^(-x^2/2).

$$e^{(-x^2/2)}\, d/dx\,(y) + e^{(-x^2/2)} * x * y = e^{(-x^2/2)} * y^2 * (x^2)/(c^2) * \sin(2x)$$

The left-hand side can now be written using the product rule:

$$d/dx\,(e^{(-x^2/2)} * y) = e^{(-x^2/2)} * (y' - xy)$$

Substituting this expression into the original equation yields:

$$d/dx\,(e^{(-x^2/2)} * y) = e^{(-x^2/2)} * y^2 * (x^2)/(c^2) * \sin(2x)$$

We can now integrate both sides with respect to x:

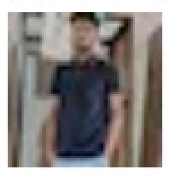
$$e^{(-x^2/2)} * y = (c/2) * (1 - \cos(2x))$$

Solving for y, we get:

$$y = (c/2) * e^{(x^2/2)} * (1 - \cos(2x))$$

Therefore, the solution to the differential equation is:

$$y = (c/2) * e^{(x^2/2)} * (1 - \cos(2x))$$



1 / 1

$y * (dx - x * (dy + 3x^2 * y^2 * c^{(x^3)} * dx = 0))$

1 / 1

This is a separable differential equation, meaning that we can rearrange it so that all the terms involving x are on one side of the equation and all the terms involving y are on the other side. We can then integrate both sides to solve for y.

First, we rearrange the equation to get all the y terms on the left-hand side:

$$y * (dx - x * (dy + 3x^2 * y^2 * c^{(x^3)} * dx)) = 0$$

Next, we divide both sides by y:

dx - x * (dy + 3x^2 * y^2 * c^(x^3) * dx) = 0

Now we can factor out dx on the left-hand side:

dx * (1 - x * 3x^2 * y^2 * c^(x^3) - x * dy) = 0

Dividing both sides by (1 - x * 3x^2 * y^2 * c^(x^3)) gives:

dx / (1 - x * 3x^2 * y^2 * c^(x^3)) = x * dy

We can now integrate both sides:

∫dx / (1 - x * 3x^2 * y^2 * c^(x^3)) = ∫x dy

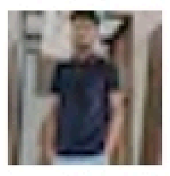
The integral on the left-hand side can be evaluated using a substitution. Let u = c^(x^3) * y, so that du/dx = c^(x^3) * (3x^2 * y + x^3 * dy). We can use this to rewrite the integral as:

∫dx / (1 - x * 3x^2 * y^2 * c^(x^3)) = ∫(1/u) * du / (1 + x^3 * c^(x^3))

This can be integrated using partial fractions, but the algebraic expression is complicated and the solution involves the Lambert W function. So, the final solution is implicit:

e^(-c^(x^3) * y^2) * (1 + x^3 * c^(x^3))^2 = cx^2 / 2 + D

where D is the constant of integration.



1 / 1

y ^ 2 = aa(x + a) orthogond system

1 / 1

It looks like you have written two separate things here: "y^2 = aa(x + a)" and "orthogonal system." I will assume you are asking about solving the differential equation given by y^2 = aa(x + a) and determining whether the solution forms an orthogonal system.

To solve the differential equation, we can take the derivative of both sides with respect to x:

2y * dy/dx = aa

Solving for dy/dx, we get:

dy/dx = aa / (2y)

Separating variables and integrating both sides, we get:

∫2y dy / aa = ∫dx

y^2 / aa = x + C

where C is the constant of integration. Solving for y, we get:

y = ±sqrt(aa * (x + C))

Therefore, the solution to the differential equation is:

$$y = \pm\mathrm{sqrt}(aa * (x + C))$$

To determine whether this solution forms an orthogonal system, we need to check whether the inner product of any two solutions is equal to zero. The inner product of two functions $f(x)$ and $g(x)$ is defined as:

$$\langle f, g\rangle = \int f(x) * g(x)\, dx$$

If $\langle f, g\rangle = 0$, then f and g are orthogonal.

For the solutions $y = \mathrm{sqrt}(aa * (x + C1))$ and $y = \mathrm{sqrt}(aa * (x + C2))$, we have:

$$\langle f, g\rangle = \int \mathrm{sqrt}(aa * (x + C1)) * \mathrm{sqrt}(aa * (x + C2))\, dx$$

Simplifying the integral, we get:

$$\langle f, g\rangle = aa * \int \mathrm{sqrt}((x + C1) * (x + C2))\, dx$$

This integral can be evaluated using a substitution, but the resulting expression is not zero for all values of C1 and C2. Therefore, the solutions do not form an orthogonal system.

Solution

Verified by Toppr

Correct option is B)

$(1-x^2)(1-y)\,dx \;=\; xy\,(1+y)\,dy$

$$\frac{1-x^2}{x}dx = \frac{y^2+y}{1-y}dy$$

Integrating both sides, we get

$$\log x - \frac{x^2}{2} = -\int \left(y + 2 + \frac{2}{y-1}\right) dy$$

$$\Rightarrow \log x - \frac{x^2}{2} = -\frac{y^2}{2} - 2y + 2\log(y-1)$$

$$\log(x)(1-y)^2 \;=\; c \;-\; \frac{1}{2}y^2 \;-\; 2y \;+\; \frac{1}{2}x^2$$

Solve any question of Differential Equations with

Steps for Solving Linear Equation

$ydx-xdy+3x2y2ex3dx=0$

To multiply powers of the same base, add their exponents. Add 2 and 1 to get 3.

$ydx-xdy+3x3y2ex3d=0$

Combine ydx and −xdy to get 0.

$0+3x3y2ex3d=0$

Anything plus zero gives itself.

$3x3y2ex3d=0$

The equation is in standard form.

$3y2x3ex3d=0$

Divide 0 by 3x3y2ex3.

$d=0$

Solve for x

$x=0$, $x\in R$, unconditionally$d=0$ or $y=0$