Doubt Clearing Session

Detailed Course on Differential Equation for IIT JAM' 23 - II

Gajendra Purohit • Lesson 7 • Aug 16, 2022

Gajendra Purohit

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Integrating factor : If an equation of the form $Mdx + Ndy = 0$ is not exact, it can always be made exact by multiplying by some function of x and y such a multiplier is called an integrating factor.

Note : The differential equation $Mdx + Ndy = 0$ posses an infinite number of integrating factor.

Rule – 1 : If $Mdx + Ndy = 0$ is homogeneous and $(Mx + Ny) \neq 0$

then $\frac{1}{Mx+Ny}$ is an integrating factor.

Rule – 2 : If $Mdx + Ndy = 0$ is of the form $f_1(xy)ydx + f_2(xy)xdy = 0$ then $\frac{1}{Mx - Ny}$ is an integrating factor provided $Mx - Ny \neq 0$

Rule – 3 : If $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ is a function of x alone say f(x) then

$e^{\int f(x)dx}$ is an integrating facor.

Rule – 4 : If $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$ is function of y-alone say f(y) then

$e^{\int f(y)dy}$ is an integrating factor.

Q.1 An integrating factor of the differential equation $\left(y+\frac{1}{3}y^2+\frac{1}{2}x^2\right)dx+\frac{1}{4}(x+xy^2)dy=0$ is

(a) x^2 (b) $3\log_e x$

(c) x^3 (d) $2\log_e x$

Q.2 If $x^h y^k$ is an integrating factor of the differential equation $y(1 + xy)dx + x(1 - xy)dy = 0$, then the ordered pair (h, k) is equal to

(a) (-2, -2)

(b) (-2, -1)

(c) (-1, -2)

(d) (-1, -1)

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Q.3. The solution of differential equation

$(1+y^2)\,dx+\left(x-e^{\tan^{-1}y}\right)dy=0$ is

(a) $(x-2)=ke^{-\tan^{-1}y}+k$

(b) $xe^{\tan^{-1}y}-2e^{2\tan^{-1}y}=k$

(c) $xe^{-\tan x}=\tan^{-1}y+k$

(d) $xe^{2\tan^{-1}y}=e^{\tan^{-1}y}+k$

Q.4 Let $y(x)$ be the solution of the differential equation $(xy + y + e^{-x})dx + (x + e^{-x})\,dy = 0$ satisfying $y(0) = 1$. Then $y(-1)$ is equal to

(a) $\frac{e}{e-1}$

(b) $\frac{2e}{e-1}$

(c) $\frac{e}{1-e}$

(d) 0

Q5. Consider the differential equation $\left(x-\frac{1}{y}\right)dy + y^2dx = 0$;

$y(1) = 1$ then as $y \to \infty$, x equals

(a) 0

(b) $\frac{1}{e}$

(c) $1+\frac{1}{e}$

(d) $1-\frac{1}{e}$

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Educator Profile

Gajendra Purohit

#5 Educator in CSIR-UGC NET

Dr.Gajendra Purohit PhD, CSIR NET (Maths) | Youtuber(330K+30k Sub.)/Dr.Gajendra Purohit (Maths), 17+ Yr. Experience, Author of Bestseller

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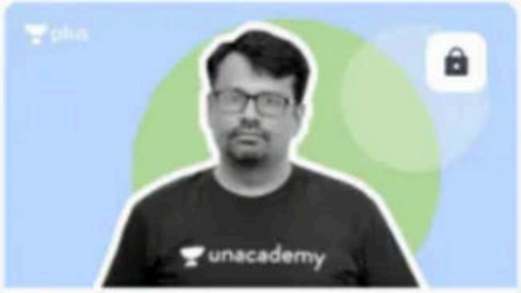

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Educator highlights

- Works at **Pacific Science College**
- Studied at **M.Sc., NET, PhD(Algebra), MBA(Finance), BEd**
- PhD, NET | Plus Educator For CSIR NET | Youtuber (260K+Subs.) | Director Pacific Science College |
- Lives in **Udaipur, Rajasthan, India**
- Unacademy Educator since

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