Doubt Clearing Session

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

Gajendra Purohit • Lesson 17 • Aug 30, 2022

Gajendra Purohit

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COMPLETE COURSE ON

MATHEMATICS

FOR IIT-JAM 2022

VARIATION OF PARAMETERS

Consider a second order differential equation as follows

$$y'' + Py' + Qy = R$$

Let u and v are parts of CF then, Complete solution of given differential

equation is $y = c_1 u + c_2 v + Au + Bv$

Where c_1, c_2 are arbitrary constants & A and B are to be determined.

$$A = -\int \frac{Rv}{W} dx, B = \int \frac{Ru}{W} dx \text{ where } W = \begin{vmatrix} u & v \\ u' & v' \end{vmatrix}$$

Example1. Using the method of variation of parameters, solve $y'' + y = \sec x$

Example2. Using the method of variation of parameters, solve

$$y'' - 3y' + 2y = \frac{e^x}{1+e^x}$$

Q1. Let $y(x)=u(x)\sin x+v(x)\cos x$ be a solution of differential equation $y''+y=\sec x$ then $u(x)$ is **[IIT: JAM-2015]**

(a) $\ln|\cos x|+C$ (b) $-x+C$

(c) $x+C$ (d) $\ln|\sec x|+C$

Q2. Assume that $y_1(x)=x$ and $y_2(x)=x^3$ are two linearly independent solutions of the homogeneous differential equation $x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+3y=0$ using the method of variation of parameters find a particular solution of the differential equation $x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+3y=x^5$

[IIT: JAM-2012]

(a) $\frac{x^5}{8}$ (b) $-\frac{x^5}{8}$

(c) $\frac{x^5}{4}$ (d) None of these

Q3. A particular integral of the differential equation $y'' + 3y' + 2y = e^{e^x}$ is

[IIT-JAM: 2018]

(a) $e^{e^x} e^{-x}$

(b) $e^{e^x} e^{-2x}$

(c) $e^{e^x} e^{2x}$

(d) $e^{e^x} e^{x}$

TOPICS TO BE COVERED

- REAL ANALYSIS
- FUNCTION OF ONE & TWO VARIABLE
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FOUNDATION COURSE OF

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Q4. Using the method of variation of parameters solve the differential equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=x^2$ given that $x \& \frac{1}{x}$ are two solutions of the corresponding homogeneous equation **[IIT: JAM-2007]**

(a) $c_1x+c_2\frac{1}{x}+\frac{x}{2}$ (b) $c_1x+c_2\frac{1}{x}+\frac{x^2}{3}$

(c) $c_1x+c_2\frac{1}{x}-\frac{x^3}{6}$ (d) None of these

Q5. PI Of $\frac{d^2y}{dx^2}+y=\frac{1}{1+\sin x}$

(a) $-1+\sin x+x\cos x-\sin x.\log(1-\sin x)$

(b) $-1+\sin x+x\cos x+\sin x.\log(1-\sin x)$

(c) $-1+\sin x-x\cos x+\sin x.\log(1+\sin x)$

(d) $-1+\sin x+x\cos x+\sin x.\log(1+\sin x)$

Q6. Solving by variation of parameters $y'' - 2y' + y = e^x \log x$, the value of wronskian w is

(a) e^{2x}
(b) 2
(c) e^{-2x}
(d) None of these

Q7. For $\frac{d^2y}{dx^2}+4y=\tan 2x$, solving by variation of parameters. The value of wronskian w is

(a) 1 (b) 2
(c) 3 (d) 4

Q8. Using the method of variation of parameters for the particular solution of the differential equation $y'' + 4y = \frac{3}{\sin 2x}; 0 < x < \frac{\pi}{2}$

(a) $\frac{3}{4}\sin 2x \log \cos 2x - \frac{3}{4}\cos 2x$

(b) $\frac{3}{2}\sin 2x \log \cos 2x - \frac{3}{4}\cos 2x$

(c) $\frac{3}{2}\sin 2x \log \sin 2x - \frac{3}{2}x\cos 2x$

(d) $\frac{3}{4}\sin 2x \log \sin 2x - \frac{3}{2}x\cos 2x$

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Educator Profile

Gajendra Purohit

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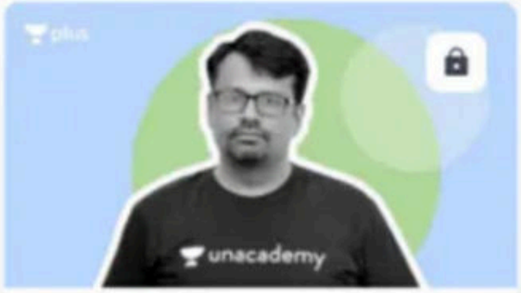

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Educator highlights

- 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**
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